LP/MP Safety Manual

Liquids Pipelines and Major Projects

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Effective Date: 01-05-2015
Version #: 1.4
Version Date: 06-01-2015

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Enbridge Liquids Pipelines and Major Projects
Health and Safety

January 2015

Table of Contents

Table of Contents 3
Values 9
Principles 10
Lifesaving Rules 11
1.0 Occupational Health and Safety Management System 12
1.1 LP/MP Safety Manual Supports the OHSMS 12
2.0 Responsibilities 14
2.1 Management 14
2.2 People Leaders 14
2.3 Workers 14
2.4 Contractors 15
2.5 Health and Safety 15
2.6 Enbridge Site Inspector 16
3.0 Incident Reporting 17
3.1 Incident Reporting 17
3.2 Investigations 17
3.3 Contractor's Verbal and Written Report of Incident 17
3.4 Incident Classification and EnCompass Incident Management System 19
4.0 General Safety 20
4.1 Right to Refuse Unsafe Work 20
4.2 Visitors and Site Access 20
4.3 Safety Orientations 21
4.4 Inspections and Observations 21
4.5 Safety Meetings 22
4.6 Alcohol and Drug Policy 22
4.7 Worksite Rules 23
4.8 Working Alone 23
4.9 Journey Management Plan 25
4.10 Housekeeping 25
4.11 Training and Competency 26
4.12 Ignition Sources 26
4.13 Bonding and Grounding 28

4.14 Hot Work 31
4.15 Cutting and Welding 32
4.16 Portable Fire Extinguishers 32
4.17 Fire Prevention and Protection 36
4.18 Entering Buildings Containing Natural Gas Products or Equipment 38
4.19 Vehicles, Equipment and Tool Use, Maintenance and Inspection 38
4.20 Ladder Safety 39
4.21 Walkways, Stairways, Exits, Landings and Openings 40
4.22 Scaffolds and non-mobile Elevated Work Platforms 40
4.23 Safeguards, Barricades, and Warning Signs 43
4.24 Brush Cutting 45
4.25 Severe and Inclement Weather 47
4.26 Work in the Dark 50
4.27 Extended Hours 50
4.28 Fatigue Management 50
4.29 Sanitary Facilities 51
4.30 Abrasive Blasting 51
4.31 Fire Watch and Safety Watch 53
4.32 Hydrostatic and Pneumatic Testing 56
4.33 Pigging 57
4.34 Warehouse, Lay-Down and Storage Areas 58
4.35 Rail Locations 59
4.36 High-Pressure Water Jetting 59
5.0 Hazard Assessment, Elimination and Control Standard 61
5.1 Hazard Assessment 61
5.2 Pre-Job Meetings/Tailgates 65
5.3 Hazardous and Restricted Areas 65
5.4 Open System 76
5.5 Site Planning 76
6.0 Safe Work Permit and Work Authorization Standard 78
6.1 Responsibilities for Issuing Safe Work Permits and Work Authorization 78
6.2 Safe Work Permit Requirements 81
6.3 Work Authorization Requirements 85
6.4 Suspension of Work Authorization and Safe Work Permits 85
7.0 Personal Protective Equipment Standard 87
7.1 Personal Protective Equipment 87
7.2 Head Protection 95
7.3 Eye and Face Protection 96

7.4 Hand Protection 98
7.5 Foot Protection 99
7.6 Hearing Conservation 101
7.7 High-Visibility Safety Apparel 103
7.8 Flame Resistant Garments 104
7.9 Respiratory Protective Program 106
7.10 Additional PPE Requirements 113
8.0 Confined Space Entry Standard 114
8.1 Responsibilities 114
8.2 Training and Qualification 118
8.3 Confined Space Classes 120
8.4 Work Practices 121
8.5 Confined Space Entry Permit 121
8.6 Confined Space Hazard Assessment 122
8.7 Isolation Requirements 123
8.8 Ventilation Requirements 123
8.9 Atmospheric Monitoring and Sampling 125
8.10 Confined Space Procedure Requirements 126
8.11 Pre-Job Entry Meeting 127
8.12 On-Site Evacuation and Rescue 127
8.13 Top-Entry Confined Spaces 129
8.14 Confined Space Signage 129
9.0 Injury Prevention Standard 130
9.1 Injury Prevention 130
9.2 Traction and Slipping 130
9.3 Line of Fire and Pinch Points 130
9.4 Industrial Hygiene 132
9.5 Assessment and Prevention of Ergonomic Hazards 132
10.0 First Aid and Bloodborne Pathogens Standard 136
10.1 Program Requirements 136
10.2 Controls 136
10.3 Standard Precautions 137
10.4 First Aid 138
11.0 Safety Equipment Standard 139
11.1 First Aid Equipment 139
11.2 Portable Atmospheric Monitoring and Sampling 141
11.3 Standard Safety Equipment 146

12.0 Vehicles and Mobile Equipment Standard 152
12.1 General Requirements for Drivers 152
12.2 Distracted Driving and Use of Communication Devices 153
12.3 Vehicle Safety and Signage 153
12.4 Vehicle Operation 155
12.5 Commercial Motor Vehicles- Canada 156
12.6 Commercial Motor Vehicles- United States 162
12.7 Powered Mobile Elevating Work Platforms 165
12.8 Powered Mobile Equipment 166
12.9 All Terrain and Off Road Vehicles 169
12.10 Aircraft 170
12.11 Signalers and Spotters 172
13.0 Electrical Safety Standard 175
13.1 Limited Approach Boundaries 176
13.2 High Voltage 180
13.3 Low Voltage 180
13.4 Exposed Electrical Equipment/Conductors 181
14.0 Hazardous Materials Standard 182
14.1 Characteristics of Products Transported by Pipeline 182
14.2 Storage and Transportation 183
14.3 Radiation and Radiography 186
14.4 Asbestos Management Program 188
14.5 GHS/WHMIS/HAZCOM 189
14.6 Respiratory Hazards 190
14.7 Nitrogen (Pipeline Purging) 194
15.0 Ground Disturbance Standard 196
15.1 Damage Prevention 196
15.2 Positive Identification (Exposure) of Below Grade Facilities 198
15.3 Mechanical Clearance 200
15.4 Roles and Responsibilities 201
15.5 Pile Driving, Auguring, Boring, and Drilling 203
16.0 Excavation Safety Standard 204
16.1 Mechanical Excavation 204
16.2 Worker Protection 205
16.3 Classification of Soil and Rock 206
16.4 Sloping 207
16.5 Exits and Entrances 207
16.6 Material Storage 207
16.7 Fences and Barricades 208

16.8 Winter Conditions 209
17.0 Fall Protection and Travel Restraint Standard 210
17.1 Personal Fall Arrest System 210
17.2 Fall Protection Plan 210
17.3 Rescue 211
17.4 Fall Protection Equipment 211
18.0 Control of Hazardous Energy Standard 214
18.1 Isolation 214
18.2 Responsibilities 214
18.3 Locks 215
18.4 Tags 217
18.5 Additional Lockout/Tagout Equipment 218
18.6 Isolation Points 219
18.7 Piping Isolation Methods 220
18.8 General Isolation Steps 221
18.9 Authorized Removal of Locks 223
18.10 Contractor 223
18.11 Complex Group Control Process 224
19.0 Material Handling Standard 225
19.1 Classification of Lifts 225
19.2 Preparation, Operation and Responsibilities 226
19.3 Cranes 230
19.4 Using Excavation Equipment for Lifting 231
19.5 Inspection and Maintenance 231
19.6 Requirements 232
19.7 Hoisting and Rigging 233
20.0 Tools and Equipment Standard 243
20.1 Tool and Equipment Operation 243
20.2 Electric Tools and Equipment 244
20.3 Gas-Operated Equipment 245
20.4 Air-Operated Tools and Equipment 245
20.5 Equipment and Machine Guarding 246
20.6 Compressed Gas Cylinders 246
20.7 Propane Bottles and Accessories 249
20.8 Portable Heaters 249
Acronyms 251
Defined Terms 254

Appendix..... 273

Values

Safety

- Relentlessly ensure the safety of our communities, customers, employees, contractors, and partners
- Take a proactive approach to identifying and preventing safety issues
- Take immediate action when a safety issue is identified
- Continually seek ways to improve safety performance

Integrity

- Maintain truth in all interactions
- Do the right thing; do not take the easy way out
- Take accountability for our actions, without passing the blame to others
- Follow through on commitments

Respect

- Value the contributions of others
- Take the time to understand the perspective of others
- Treat everyone with unfailing dignity

Principles

our path to Zero

HEALTH AND SAFETY AT ENBRIDGE **OUR COMMITMENT**

Enbridge is committed to ensuring everyone returns home safely at the end of each and every day, and that our assets are operated in a safe manner. *This commitment to safety is based on caring for employees, our contractors, the communities in which we operate and the environment.*

The Enbridge Values of Integrity, Safety and Respect in support of our communities, the environment and each other establish how we conduct our affairs individually and collectively at a moral and ethical level. Enbridge's Health & Safety Principles complement our Values by guiding our actions, policies, procedures and culture.

The Health & Safety Principles are fundamental expectations for all employees and contractors. They define the path to a zero-incident workplace in which safety is everyone's responsibility, leadership is accountable for safety performance, continuous improvement is required, hazards are controlled and our commitment to caring extends beyond the workday.

Safety isn't just a priority. It's our way of life. It's a core value that makes us Enbridge.

HEALTH AND SAFETY PRINCIPLES **OUR PATH TO ZERO**

Zero1 All injuries, incidents, and occupational illnesses can be prevented.

Enbridge is committed to protecting the health and safety of our employees, our contractors and the public. Our goal is to have zero injuries, incidents or occupational illnesses. Striving for anything less than "zero" can lead to the false belief that injuries, incidents and occupational illnesses are inevitable and acceptable. In every instance, following company policies and procedures, including Enbridge's six Lifesaving Rules, is a basic requirement in protecting the health and safety of workers and the public.

Zero2 All operating exposures can be controlled.

This Principle is similar to the first Principle that all injuries, incidents, and occupational illnesses can be prevented. It holds that all operating exposures and uncontrolled releases that may result in injury, illness or environmental damage can be prevented, and that effective safeguards can be provided in advance. All efforts must be made to eliminate sources of danger. However, when this is not possible or practical, policies and procedures such as the use of personal protective equipment and clothing, safety devices, etc. must be strictly followed to minimize risk. These policies and procedures should be followed to safeguard operating exposures now and in the future.

Zero3 Management is accountable for safety performance.

People leaders are accountable for safe operations and the safety and health of the workers under their direction. This includes accountability for establishing and maintaining a safe work environment, including establishing Policies and Procedures, providing the proper equipment, completing appropriate training, fixing deficiencies promptly, and ensuring processes for continuous improvement are reviewed.

Zero4 All employees/ contractors are responsible for safety.

People are the most important element of the health and safety program. Employees and contractors are expected to take personal accountability for their safety, that of their co-workers, and the safe operations of our assets; involvement is the cornerstone of a safe, interdependent workplace. Our success in safety depends on all levels of the organization being personally accountable for consistently adhering to Policies, Procedures, Regulations, Codes and Standards; working safely is a condition of employment.

Zero5 Assessment and improvement are a must.

We are committed to proactively managing our safety system performance through safety observations, inspections, assessments, process hazard reviews, investigations, quality control/assurance procedures, etc., in a way that supports our drive to zero injuries, incidents and occupational illnesses. Deficiencies revealed through these processes, and other investigations must be promptly addressed and communicated.

Zero6 We promote off-the-job health and safety for our employees 24/7.

The Company's concern for the safety and health of employees extends beyond the workplace. An off-the-job injury is as painful and impactful as one suffered on the job. Employees are encouraged to demonstrate their leadership and excellence in health and safety practices for the benefit of their families, friends and community.

Al Monaco, *President and CEO, May 1, 2013*

Lifesaving Rules

Lifesaving Rule #1

Hazard Management

Lifesaving Rule #2

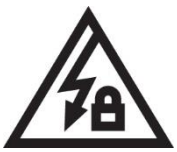
Driving Safety

Lifesaving Rule #3

Confined Space Entry

Lifesaving Rule #4

Ground Disturbance



Lifesaving Rule #5

Isolation of Energized Systems

Lifesaving Rule #6

Reporting of Safety Related Incidents

1.0 Occupational Health and Safety Management System

The Occupational Health and Safety Management System (OHSMS) establishes accountabilities for managing Enbridge's health and safety functions and provides the direction and governance for achieving safety excellence. The OHSMS is found in the Governance Document Library (GDL) in the Integrated Management Systems (IMS) and is known as IMS-04. The OHSMS also contains Enbridge's Health and Safety Policy.

The OHSMS provides the framework for Enbridge to successfully:

- evaluate and continually improve the management of health and safety
- establish clear roles and responsibilities for achieving health and safety objectives and performance targets
- measure, monitor, and report health and safety performance
- anticipate, recognize, evaluate, and control health and safety hazards and risks
- identify non-compliant conditions and ensure appropriate corrective actions and effective resolution in a timely manner
- provide a health and safety program that fosters a robust safety culture and aligns with applicable industry Standards
- ensure effective processes for developing and maintaining job competencies

1.1 LP/MP Safety Manual Supports the OHSMS

This LP/MP Safety Manual supports the OHSMS by outlining the minimum Standards to which Workers shall adhere to. The Standards shall:

- meet or exceed legislative requirements in jurisdictions where Enbridge operates
- serve as a basis for creating work procedures
- help establish safe work practices

Specific terms are used to indicate whether an action is mandatory or recommended. The following words have specific meanings:

- "shall" is used where an action is mandatory
- "should" is used where an action is recommended
- "may" is used where alternatives are equally acceptable

Acronyms and defined terms are found at the end of this manual. Defined terms are capitalized throughout this manual.

Some additional terms are capitalized, but do not appear on the list of defined terms, such as the job titles of some Enbridge personnel and some Enbridge departments.

Certain Standards and some sections within Standards are supported by additional policies, practices, processes, documentation and forms. These shall be referenced where applicable.

Any variance to a Standard, practice or requirement as set out in this manual is required to be approved by the appropriate Vice President or designate responsible for the work. Variances shall be applied for using the Variance Request form located in the appendix. All variances are applicable only to a specific project or

Standard and do not create policy. All variances shall be reviewed during annual reviews of the LP/MP Safety Manual. Contractor variances shall be reviewed as part of the Contractor Health and Safety Management System assessment. A variance shall always be in compliance with Applicable Legislation. The variance process can be found in the GDL (under IMS-04 Tier 2 processes).

2.0 Responsibilities

2.1 Management

Enbridge management and Contractor management are accountable for safety performance.

Both Enbridge management and Contractor management shall ensure their respective workforces operate in compliance with all applicable health and safety requirements which shall include Applicable Legislation and Enbridge's Health and Safety policies and Standards as follows:

- complies with Enbridge's policies, Standards and regulatory requirements
- mitigates actual and potential hazards
- maintains awareness of the health and safety impact of work activities
- investigates health and safety Incidents to prevent recurrence
- monitors and assures Workers are Qualified
- identifies, manages, and communicates hazards in the workplace, through pre-job Hazard Assessments
- stops and corrects unsafe work as appropriate
- wears, provides and appropriately uses proper Personal Protective Equipment (PPE), tools, and equipment and applies training appropriately
- verifies that Suppliers, Visitors, and other Workers under their control conduct themselves in accordance with the requirements of this manual and the Enbridge Health and Safety Policy and Principles, as well as other applicable Enbridge policies and Standards

In addition to the measures noted above, Enbridge management and Contractor management shall build a culture of proactive health and safety and continuous Workforce support for the OHSMS. Management shall be accountable for safety performance.

2.2 People Leaders

People Leaders are responsible for:

- ensuring that Workers receive required training and are Qualified to perform the task they are assigned
- enforcement of the health and safety Standards in this manual, and ensuring the desired health and safety outcomes are achieved
- ensuring that actual and potential hazards are mitigated
- ensuring each worker is fit for duty, i.e., is able to perform the physical demands of the job in a safe, and effective manner, and is are free of impairment from such things including without limitation, fatigue, alcohol or drugs

2.3 Workers

Workers shall comply with all Enbridge health and safety policies, Standards and Applicable Legislation. Workers shall:

- immediately report all incidents to their People Leader
- support investigations by providing full cooperation as requested
- wear proper PPE and use appropriate tools and equipment
- stop work if unsafe conditions or unsafe work practices/behaviors occur

- complete required training and display competency in the performance of their work
- participate in pre-job meetings and hazard assessments
- have the proper training and authorization to operate equipment
- be fit for duty by being able to perform the physical demands of the job in a safe, and effective manner, and be are free of impairment from such things including without limitation, fatigue, alcohol or drugs

As noted, Workers have a responsibility to stop unsafe work. Workers also have the right and responsibility to refuse unsafe work without fear of retaliation.

2.4 **Contractors**

Contractors and Subcontractors shall comply with Enbridge health and safety Standards set out in this manual. If a Contractor has a health and safety standard or policy materially different from Enbridge's, the Contractor shall follow the most stringent requirement.

All Contractors shall:

- comply with all contractual obligations and Applicable Legislation
- ensure their employees and Subcontractors are orientated to and comply with Enbridge's requirements in this manual
- hold regularly scheduled and documented safety meetings for the duration of the assigned work or project
- ensure all workers are trained and Qualified to perform their assigned work activities
- conduct formal safety inspections of their work area's (e.g., weekly or per-shift) and ensure all identified deficiencies are tracked and corrected and all tracking and corrective actions are documented

Contractors who fail to comply with the Standards and requirements set out in this manual may be subject to the shutdown of their work and/or termination of their contract with Enbridge. Such shutdown or termination is applicable to all Contractor activities or undertakings, including construction, maintenance, or other activities under the oversight of an Enbridge Site Inspector or Enbridge Operations Representative.

Some Standards in this manual set out additional, specific requirements for Contractors. Unless otherwise specified by the contract, Contractors not working under the direct supervision of an Enbridge Operations Representative shall comply with the additional Contractor requirements detailed in the Boilerplate found the appendix for section 2.4.

2.5 **Health and Safety**

Each Enbridge region, department, project and Worksite has designated health and safety personnel responsible for the following:

- sustaining and promoting a workplace health and safety culture
- coaching and mentoring People Leaders to improve health and safety performance
- auditing for compliance with safety Standards and the Lifesaving Rules for high risk work

- analyzing health and safety performance data and trends, identifying opportunities for improvement, and making health and safety recommendations

Examples of designated health and safety personnel include Project Safety Inspector, Construction Safety Coordinator, Field Safety Coordinators and/or Regional Safety Coordinator.

2.6 **Enbridge Site Inspector**

The Enbridge Site Inspector shall be responsible for enforcing compliance with the OHSMS, the Standards in this manual, and all Applicable Legislation on site. The Enbridge Site Inspector shall also:

- monitor all Contractor field activities to ensure compliance with Enbridge and project specific policies and Standards
- monitor the Contractor to ensure compliance with regulatory requirements, including permits and to ensure any other health and safety expectations are achieved
- assist in project-related incident response and investigation processes
- notify the Project Safety Inspector/Construction Safety Coordinator/Regional Safety Coordinator(s) of all Incidents and safety concerns
- consult with the Project Safety Inspector/Construction Safety Coordinator/Regional Safety Coordinator(s) on all issues concerning safety and health

3.0 Incident Reporting

3.1 Incident Reporting

Enbridge maintains a comprehensive incident reporting system set out in its Operations and Maintenance Manual (OMM) Book 1 – General Compliance Reference – to ensure compliance with internal and regulatory reporting requirements.

All work-related Incidents of which an employee becomes aware shall be reported immediately to a People Leader or, in the case of Contractor personnel, to an Enbridge Representative. Incident reporting requirements apply to all Workers. The following incidents shall be reported:

- occupational Injuries and illnesses
- Motor Vehicle Incidents (MVIs)
- any property damage
- Near Misses
- Below Grade Facility Contacts
- fire or explosion
- Process Safety Incidents
- releases, leaks and spills

For clarity, ordinary wear and tear of a vehicle is not considered an MVI or property damage.

Adhere to the applicable Incident reporting guidelines (e.g., OMM Book 1) for individual business units where applicable.

3.2 Investigations

All Incidents and Near Misses shall be investigated to determine basic and root causes as well as system needs. The depth of investigation shall be dependent on the classification and severity of the incident as well as the potential for loss.

Learnings from investigations shall be used to determine corrective and preventative actions aimed at preventing recurrence. Investigations will focus on fact-finding and not place blame. Each investigation shall be initiated immediately, once the location and conditions are deemed safe.

Incident notifications for all Enbridge and Contractor Incidents shall be recorded in the EnCompass Incident Management System.

3.3 Contractor's Verbal and Written Report of Incident

Incidents that occur when a Contractor is working for Enbridge shall be reported verbally immediately to the specified Enbridge Representative.

An initial written report shall be completed and provided to Enbridge by the Contractor within 48 hours of an Incident. The initial report can be in draft form.

A detailed final report shall be submitted within 7 calendar days of the incident unless additional investigation time is necessary. If so, a request for more time shall be made to the specified Enbridge Representative.

Contractor Incidents that occur off of Enbridge Locations, including all work related MVI's, shall be immediately reported to an Enbridge Representative. The purpose of this notification is for information only. Such incidents may or may not be recordable.

The Contractor's investigation report shall include all relevant details of the Incident, including but not limited to:

- date/time/location of the Incident
- type of incident, e.g., injury, illness, MVI, property, Near Miss
- detailed Incident description
- persons involved
- injured Worker information; including nature of injury; body part and location
- description or nature of property or other damage
- immediate, basic, and root causes, e.g., substandard practices or conditions, work or environmental conditions, job or process-related factors, personal factors, etc.
- preventive actions taken and/or recommended measures to prevent recurrence (e.g., need for systems/controls, or changes to work processes or systems)
- statements from injured Worker(s), witnesses, supervisor(s), or others as required
- photographs and drawings
- police report (if applicable)
- follow-up actions taken by the Contractor
- report to be signed and dated by an authorized Contractor representative

Where a Contractor is required by Applicable Legislation to report an Incident to an Authority Having Jurisdiction (e.g. workers compensation authority or provincial, federal or state occupational health and safety regulator), the Contractor shall report such Incident in accordance with Applicable Legislation. The Contractor shall also ensure it completes within a reasonable time frame or a defined time frame, as the case may be, any corrective actions required of it in response to the Incident.

Following an Incident report, the Contractor shall regularly update the Enbridge Representative on the status of follow-up actions.

The Contractor shall classify injuries/illnesses in accordance with Applicable Legislation that applies to the Contractor's business operations. Enbridge reserves the right to record and classify injuries internally based on available information for purposes of maintaining Contractor safety performance metrics.

In addition, the Contractor shall cooperate and provide all required information, as permitted by law, to assist Enbridge's internal investigation of any Incident.

Similarly, Contractors are responsible for their Subcontractors and shall conduct a detailed Incident investigation of Subcontractor Incidents.

Each Contractor and Subcontractor shall have a Modified Work element in their health and safety program. The Modified Work element shall include but is not limited to:

- having the relevant medical and/or Workers' compensation form(s) readily available to an injured Worker, for the Worker to complete and provide to a physician

- data tracking to indicate if the injury warrants lost time, Modified Work, or no work restrictions
- an overall focus on facilitating an injured Worker's return to work as soon as possible

3.4 Incident Classification and EnCompass Incident Management System

Enbridge will determine and record the final classification of all Incidents.

All Incidents shall be entered into the Enbridge EnCompass Incident Management System.

4.0 General Safety

4.1 Right to Refuse Unsafe Work

Workers have the right, responsibility, and authority to refuse any work where there are reasonable grounds to believe it is dangerous to the health and safety of themselves or any person at an Enbridge Worksite.

In addition, Workers are responsible to stop any work that they reasonably believe presents an imminent or serious threat to the life or health of a Worker or other person exposed to a hazard, condition or activity.

If a Worker has a safety concern, or refuses work the Worker reasonably believes is unsafe, the Worker shall immediately contact their People Leader before proceeding with the work. All refusals of unsafe work shall be investigated and addressed with the Worker before the work proceeds. If unsafe work conditions, activities or hazards are identified during the investigation, corrective measures shall be implemented to resolve such conditions, activities or hazards before the work proceeds.

Workers also have the right to know about the hazards associated with their work and to participate in the mitigation of the hazards.

Any form of retaliation against a Worker who in good faith refuses unsafe work is prohibited.

4.2 Visitors and Site Access

Prior to accessing an Enbridge Worksite, each Visitor shall report to the designated security or site contact for clearance.

The term Visitor includes non-Enbridge personnel, Contractors not performing assigned work activity at that location, and Enbridge employees from other locations.

Visitors shall be at a Worksite only for work-specific purposes. At a minimum, Visitors shall be required to:

- sign in and out
- provide an Enbridge point of contact, with name and telephone number
- provide their vehicle description and license plate number
- provide a personal/contact cellphone number while on premises
- provide positive identification, e.g., government issued photo identification
- provide proof that the required safety orientations have been completed
- attend a site-specific safety orientation
- comply with Enbridge rules and regulations for that Worksite
- display visitor identification as directed
- if required by Enbridge, provide and wear PPE or designated apparel

Contractors shall provide advance notice to Operations/Management at the Worksite of their intent to bring Visitors on site. Unauthorized persons shall not be allowed on Enbridge property.

Contractors shall provide advance notice to Operations Management or the Enbridge Representative of expected deliveries of equipment and/or materials to the Worksite. Any equipment and/or materials brought onto Enbridge Worksites shall have prior authorization.

Workers shall ensure Visitors are escorted at all times when visiting an Enbridge Location.

Workers shall immediately report to their People Leader:

- unknown personnel
- unidentified vehicles or vehicles operating out of the ordinary in a manner not consistent with their intended use
- objects found or missing (e.g., parcels/packages)
- suspicious activities (e.g., loitering, taking of unauthorized pictures/video)
- actual or perceived threats to harm or injure persons or property

4.3 Safety Orientations

Prior to working at a Worksite, each Worker shall complete the safety orientations required by the applicable training matrix. This may include, but is not limited to the following:

- new employee safety orientations
- facility/site/project specific safety orientations
- Safety orientation for office employees visiting field locations (also required for visits to Vendor and Supplier facilities)

Contractors shall have their own orientation program. This program shall:

- familiarize new Workers with the Contractor's rules, policies, procedures, site-specific hazards and any other relevant requirements or health and safety matters; and
- similarly familiarize new Workers with all Enbridge health and safety requirements

4.4 Inspections and Observations

Inspections shall be completed as outlined in the Enbridge OHSMS or in accordance with the Contractor's inspection process.

Inspections shall occur at all Enbridge Locations to identify and recognize safety hazards or when other safety concerns need to be addressed. The inspection details shall be documented on an inspection checklist or similar document.

Enbridge's safety observation program process is a proactive program where Workers conduct observations of work activities to identify safe and/or unsafe behaviors and actions. If required, corrective measures are implemented to prevent Incidents (e.g., injury or loss) from occurring.

The program's main objectives are:

- Injury and loss prevention
- increased safety awareness
- fostering a positive workplace safety culture
- recognizing Workers for their safe actions

The safety observation process requires all Workers to participate in the safety observations program.

Training shall be provided to Workers who conduct safety observations. When a safety observation is conducted, the Workers being observed shall be informed, and shall actively participate in the process.

When the safety observation is complete, a two-way conversation shall take place between the observer and the observed, to discuss the findings and any corrective measures. Safety observations shall be reported, recorded and tracked over time to identify trends or issues.

The number of safety observations required is set by Enbridge's senior management, or department managers (per business unit) or project management, in accordance with business targets and shall be communicated to Workers.

4.5 Safety Meetings

Safety meetings shall be conducted in accordance with this manual, and as required by Applicable Legislation.

Departmental safety meetings shall be held quarterly, at a minimum.

Regional safety meetings shall be held monthly, at a minimum.

Safety stand downs shall be conducted as required.

At a minimum, Contractors shall conduct and document:

- a daily "tailgate" safety meeting; to review work permits and health and safety issues associated with the day's work, and/or in some cases, prior to a specific high-risk task
- a weekly (or once per work rotation), formal safety meeting to review all health and safety issues; the Contractor shall provide a copy of the written minutes of this meeting to the Enbridge Representative

Please refer to section 5.2 – Pre-Job Meetings/Tailgates for more information on pre-job meetings.

4.6 Alcohol and Drug Policy

Enbridge is committed to providing workplaces that protect people, property and the environment from harm. It recognizes that the use of illicit drugs and the inappropriate use of alcohol, medication (prescribed or over-the- counter) or other substances can adversely affect work performance and the health, safety and well-being of employees, contractors, consultants, worksite visitors and the public.

Working under the influence or possession of alcohol or illegal drugs while working is prohibited. Any person taking a drug (including a medically prescribed drug) which may impair their ability to work safety shall advise his/her supervision to ensure that safety on the job will not be compromised.

All Alcohol and Drug Testing shall be done in accordance with the provisions set out the applicable policy and applicable regulatory requirements and standards.

All Enbridge employees and contractors must comply with the applicable company Alcohol & Drug Policies and the Applicable Legislation, as outlined in the following:

- The Alcohol & Drug Free Workplace Policy for Enbridge Employees located on eLINK under Policies & Resources > Human Resources

- LP/MP Canadian Contractor Alcohol & Drug Policy located in the Governance Documents Library>IMS-04>Contractor Safety Management and ISN Bulletin Board
- US DOT and Non-DOT Drug and Alcohol requirements for Contractors located in the Governance Documents Library>IMS-04>Contractor Safety Management and ISN Bulletin Board.

4.7 **Worksite Rules**

Workers shall adhere to the following rules while at the Worksite:

- smoking, including electronic cigarettes, is only allowed outdoors in marked, designated areas; a proper waste container shall be provided, along with a 20 lb. ABC fire extinguisher
- pets are not allowed on Enbridge Locations
- firearms, weapons and archery equipment are prohibited on Enbridge Locations
- all tools and equipment shall be used in accordance with the manufacturers' specifications
- cameras, audio-visual and communications equipment are only allowed in Hazardous and Restricted Areas with a Safe Work Permit and the permission of regional operations when on brown field sites
- Guidelines for Work Attire apply

Unless prohibited by Applicable Legislation (e.g., vehicles, busses, labs, offices etc.), smoking is permitted on the ROW providing that the ROW is stripped of vegetation and the work activity is outdoors on exposed mineral soil. The Contractor shall keep the ROW free of discarded cigarette butts by providing an adequate number of waste containers and maintain 20 lb. ABC fire extinguishers readily available via portable equipment and/or work vehicles. Smoking outside of unmarked areas on the ROW is prohibited in hazardous areas including near refueling operations, and within 30m (100 ft.) of any exposed operating facility.

The dress code for field office attire will consist of:

- long pants (no shorts)
- shirts (no sleeveless shirts)
- closed toe and closed heel shoes

Enbridge has a Respectful Workplace Policy. Personal conduct shall remain safe and professional at all times. The following misconduct will not be tolerated and will result in disciplinary action up to and including termination:

- harassment (including sexual harassment)
- horseplay
- violence or threatening behavior
- property damage
- violation of Enbridge's Respectful Workplace Policy; the Respectful Workplace Policy can be found on ELink under Policies & Procedures

4.8 **Working Alone**

Working alone practices shall be developed for Enbridge Locations. The practices shall include considerations for both normal and unexpected work situations.

This includes Workers required to travel alone to remote locations or where there is no routine interaction with other people. Working alone practices shall include, but not be limited to:

- specific controls for identified hazards
- effective communication devices/systems
- an escalation strategy for when contact with a Worker is lost
- rules setting out types of work that cannot be completed while working alone, including, but not limited to:
    - Confined Space Entry work
    - certain High Voltage electrical work
    - certain Open System work
    - energized substation work
    - work in excavations
    - work where the use of fall arrest equipment at heights over 2 m (6 ft.) is required
    - working with quick acting toxic materials (identified by the Safety Data Sheet (SDS))
    - using supplied air equipment or SCBA
    - work involving a risk of drowning
    - work on equipment that cannot be locked out once a guard or other safety mechanism is removed
    - operation of any motorized or manual materials handling equipment with an obstructed view

The practices shall also ensure that Workers do not work alone in hazardous conditions unless appropriate safety precautions are taken, which may include but are not limited to:

- personal Atmospheric Monitoring
- protection from weather conditions
- frequent communication at specific intervals

Workers shall not work alone in conditions that are or may be considered Immediately Dangerous to Life and Health (IDLH).

The Hazard Assessment shall determine:

- the hazards for each type of work being performed
- the hazards for each Worksite where Workers will potentially work alone
- the length of time the Worker is out of contact
- factors and considerations to ensure the availability of help

Working alone controls may include, but are not limited to:

- “man down” or lone worker alarm or pendant
- frequent “check-ins” with a designated contact person that:
    - are visual or two way contacts (or, a one-way system may be acceptable if it allows the worker to call or signal for help and will send a call for help if the worker does not reset the device after a predetermined interval)
    - are of a frequency not to exceed 2 hours (in some cases the duration could be shorter based on the Hazard Assessment)

    - activates the escalation strategy if contact cannot be made, or there are unusual delays in re-establishing contact
- provision for emergency rescue and first aid

Effective means of communication include, but are not limited to:

- portable or cell telephone
- walkie-talkie
- personal alarm or pager
- periodic site visits
- electronic methods, such as online web applications
- check-in system and requirement for updating an individual's status while working alone
- GPS-based communication device (e.g., SPOT Messenger)
- use of software or hardware to assist with communication in circumstances of poor network coverage

4.9 **Journey Management Plan**

People Leaders with staff (including those with staff in offices) that may be travelling as part of their role shall develop a Journey Management Plan when Workers are travelling more than 2 hours. The plan shall include:

- contact information and travel schedule (identifying the route, timeline of travel and stops to be made)
- emergency contacts and emergency response guidelines
- communication frequency
- weather and travel considerations
- changes to travel plans

If the Workers journey is hindered by weather or other emergencies, the individual's first priority should be to move to a safe location, contact emergency personnel if necessary, then contact his or her People Leader as soon as reasonably possible.

4.10 **Housekeeping**

Good housekeeping practices shall be maintained at all Enbridge Locations including, administrative and field offices, staging areas, on or off-site storage areas, and construction right-of-ways (ROWs).

The use of industrial style dumpsters is recommended in areas where large volumes of waste can be expected. Garbage shall not be allowed to accumulate on a construction ROW. Ensure waste receptacles are emptied regularly and all garbage is collected and removed as required. Wildlife risks need to be assessed when determining waste receptacle and removal criteria.

To maintain a clean, hazard-free workplace, all groups shall follow the general practices for safe housekeeping which include but are not limited to:

- ongoing Worksite cleanup
- individual cleanup duties for all Workers
- materials piled, stacked, or otherwise stored to prevent tipping or collapsing
- materials stored away from overhead powerlines

- work, travel and emergency equipment areas kept tidy, well-lit, and ventilated

4.11 Training and Competency

Prior to performing work tasks, Workers working at Enbridge Locations shall be trained and Qualified to competently perform the work. If a Worker is not Qualified to perform the work, the Worker shall only perform the work under the supervision of a Qualified Worker until such time the Worker is deemed to be Qualified.

Work on Enbridge Locations shall ensure the span of control meets applicable industry practices, in regards to training, Competency, and Worker qualifications, e.g., proper journeymen to apprentice ratios, Operator Qualification (OQ) Plans will be used when appropriate.

Workers shall be trained:

- according to the applicable Enbridge training matrix or the Contractor's internal requirements
- in the operation of vehicles, tools and equipment that they are required to use
- in the safe work practices and hazards associated with the vehicles, tools and equipment they use
- to safely carry out the tasks or work activities associated with their job function
- beyond the requirements set out in this manual when required by Applicable Legislation

Contractors shall be able to provide proof of training of its Workers to an Enbridge Representative upon request.

If a Worker's training, certification or qualification for a Critical work task or duty is or becomes expired, it shall not be considered valid and the Worker shall be required to complete the required training and receive a valid certification before the Worker will be permitted to perform the Critical work task or duty to which the certification applies.

4.12 Ignition Sources

Ignition sources have the potential to cause fires and/or explosions in areas where flammable vapors/gases are potentially present in the air. Ignition sources are typically created during Hot Work activities. Ignition sources include:

- sparks (e.g., from electrical tools and equipment; welding, cutting and grinding; static electricity)
- use of lighters, matches, cigarettes
- open flames (e.g., portable torches and heating units)
- surfaces with enough heat to vaporize a combustible material (e.g., catalytic converter of an automobile in dry grass)
- combustion engines or sources (e.g. vehicles/equipment, generators, compressors, mowers)

Vehicles and equipment left unattended in a Restricted or Hazardous Area shall be shut off and not restarted until Atmospheric Monitoring confirms the absence of hazardous vapors.

The following precautions shall be made to eliminate or minimize ignition sources:

- When in Hazardous and Restricted Areas:
    - test for oxygen levels and flammable atmospheres prior to introducing ignition sources and continuously monitor these areas while ignition sources are present
    - if a flammable atmosphere is present, use only explosion-proof electrical installations and explosion-proof electrical equipment
    - use only intrinsically safe electronic devices unless the air is initially tested and continuously monitored for flammable vapors and the equipment is listed on the SWP
    - shutdown vehicles and equipment whenever possible or when left unattended (do not restart the vehicle or equipment until Atmospheric Monitoring confirms the absence of a flammable atmosphere)
    - use non-sparking tools that are kept clean and free from ferrous or other contaminants which may hamper non-sparking properties
    - control all potential ignition sources
    - ground and bond as required in section 4.13 Bonding and Grounding
- do not stop vehicles or equipment in areas where there is combustible ground cover like dry grass, weeds or straw
- leave strike-anywhere matches and lighters with open mechanisms, including disposable lighters in designated areas (e.g., left inside a vehicle or locker)
- do not position portable light plants and/or generator sets near combustible or flammable material
- do not drill metals without sufficient lubrication
- do not mechanically cut pipe at speeds that produce excessive heat
- inspect and maintain equipment regularly (e.g.,friction in a defective or under-lubricated equipment bearing can overheat the bearing and cause a fire by vaporizing and igniting lubricating oil)
- ensure diesel-fueled equipment is equipped with:
    - an exhaust system fitted with a functional spark arrester (excluding turbocharged equipment); to remain effective, spark arresters shall be periodically blown clean with compressed air through the cleanout plug
    - an air intake system fitted with a positive air shut-off with a rev limiter; if not equipped in this manner, then initial and constant Atmospheric Monitoring is required when the diesel-driven equipment is used in Hazardous or Restricted Areas

Pyrophoric iron sulfide is a black deposit that can build up in locations such as storage tanks, seal pots, piping and metal sumps. It develops when sulfur comes in contact with iron. When the deposit dries, it can ignite spontaneously. Precautions include:

- identify equipment where iron sulfide is suspected
- tanks and vessels shall be purged of hydrocarbon vapors before opening.
- when iron sulfide is suspected to be present, provisions shall be made to keep the inner surfaces of opened equipment wet
- disposal of accumulated iron sulfide shall be handled quickly and carefully to avoid creating a hazard

Pyrophoric iron sulfide deposits may develop in tanks where sour crude oil or refined products have been stored. These deposits can ignite spontaneously when

they dry out. Use water spray to soak iron sulfide at least once every 24 hours, or more frequently if considered necessary by Operations Management.

In cone roof tanks, iron sulfide deposits may develop above the normal level of oil in the tank, or in the sludge at the bottom of the tanks (through scale from the roof having flaked off). Iron sulfide in the sludge at the bottom of the tank is not a spontaneous ignition hazard in the tank, but it will ignite spontaneously if allowed to dry out in the sun.

On tanks with pantograph seals, iron sulfide deposits may develop in the vapor space between the sealing ring and the shell of the tank. Spray water into the vapor space at least once every 24 hours, or as often as necessary to keep this space damp. Other types of floating roof tanks do not require wetting down unless there is reason to suspect pyrophoric iron sulfide may be present.

4.13 **Bonding and Grounding**

Electric charges can build up on an object or liquid when certain liquids (e.g., petroleum solvents, fuels) move in contact with other materials. This can occur when liquids are poured, pumped, agitated, stirred or flow through pipes. This buildup of electrical charge is called static electricity. Static electricity can potentially discharge (cause an explosion) when sufficient amounts of flammable or combustible substances are located nearby.

To prevent the buildup of static electricity and prevent sparks from causing a fire, it is important to bond or ground exposed metal. Bonding is done by making an electrical connection from one metal container to the other. Grounding is done by connecting the container to an already grounded object that will conduct electricity. This ensures that there will be no difference in electrical potential between the two containers and, therefore, no sparks will be formed.

Bonding and/or Grounding shall be completed as required, including, but not limited to the following tasks:

- cutting and separating a pipeline
- separating flanges
- loading or off-loading at sump tank locations
- dispensing flammable liquids from bulk drums into a secondary container
- removing an accessory attachment from a fixed Facility (e.g., a mixer from a tank)
- using abrasive blasting equipment to clean tanks
- hydrovacing
- spray painting
- when using compressors, pumps and generators

Bonding and/or grounding may be required for the following tasks:

- drawing samples from the pipeline
- draining oil from the pipeline into a pan

Enbridge Employee specific procedures for bonding, grounding and mitigating induced voltage can be found in the OMM’s, Book 3.

In some cases, such as where piping forms an electrical bond, it may not be necessary to install bonding cables. Bonding cables shall meet Enbridge requirements set out in this manual, industry standards and Applicable Legislation.

Prior to use and during use, all portable equipment used in Bonding and Grounding work (e.g., welding units, generators, portable light plants, air compressors, etc.) shall be properly grounded, in accordance with manufacturers' specifications and Worksite requirements.

Workers shall:

- wear appropriate hand protection when there is potential exposure to induced high voltage, including when handling pipe, valves, casing or measuring equipment
- avoid breaking, cutting or detaching bonding cables once they are in place, for as long as a fire hazard exists
- ground or electrically bond containers to each other when transferring liquids
- only fill portable fuel containers when they are on the ground (never do so in truck beds, on tailgates or in the trunks of vehicles)
- immediately contact Qualified Workers if there are any concerns about induced high voltage and work equipment
- ensure each bonding or grounding point is clean and free of paint, with a positive connection
- never use chains for bonding or grounding purposes

Bonding cables:

- when drawing oil or product samples from the line, or when loading or off-loading at sump tank locations, use an uncovered braided copper wire with an alligator clip brazed/clamped to each end (or use other suitable bonding cable)
- each pipeline crew shall have at least 2 prefabricated bonding cables made of minimum 10 gauge stranded copper wire with a spade connector brazed/clamped on each end and at least 2 grounding clamps for attaching the bonding cable to the pipe
- attach one end of the bonding cable to a ground consisting of a copper ground rod

Induced Voltage

Where the pipeline follows a power line ROW, a hazard may exist if the pipeline lies within the electrical field generated by overhead transmission lines. The pipe can carry a hazardous AC voltage, known as induced voltage, which occurs as a result of stray electromagnetic field from the power lines. This hazard can also apply to pipe set up near high voltage sources on cribbing for welding.

Additional factors:

- The voltage level depends on the current in the transmission lines, the geometric configuration of the pipeline with respect to the transmission lines, and the length of pipeline paralleling the transmission line.
- Induced voltage caused by proximity to overhead transmission lines may continue to affect pipelines, even when the pipeline no longer parallels the transmission cables. Induced voltage can be a hazard for up to 16 km (10 mi) beyond the point of departure.

- Once a Below Grade Facility is exposed, it shall be checked for induced voltage prior to commencing work on the facility. The facility shall be continually checked for induced voltage as required or monitored based on the Hazard Assessment.
- The industry-accepted safe limit for induced voltage limit on pipelines, appurtenances and other below grade facilities is 15V. Therefore, bonding and grounding is required to bleed off any charge in excess of 15V.
- If further aid is required to reduce the induced voltage to below 15V, contact Operations Engineering to determine the need to install a grounding grid for bonding and grounding Below Grade Facilities, vehicles and equipment. If a grounding grid is installed, before starting work, ensure induced voltages on the bonded pipe, vehicles and equipment have been reduced to an acceptable level
- Potential induction sites/areas (T-lines) shall be tested by a Qualified Worker.
- Only Qualified Electrical Workers are to mitigate induced voltage hazards and shall do so according to specific procedures established at a regional level.
- When the potential for induced voltage exists, a Hazard Assessment shall be completed and reviewed, with the involvement of the Workers doing the work.

Contractors shall develop a safe work plan for controlling induced voltage. This plan shall include, but is not limited to, the following:

- specialized PPE
- measuring/testing
- grounding requirements for planned work
- work stoppage for adverse weather conditions

Table 1 Installing Bonding Cables

Task	Bond From	Bond To	Notes
Abrasive Blasting Equipment for Tank Cleaning	1. Blasting Hose Nozzle	1. Tank Shell or Tank Roof	
Cutting, Installing and Separating of a Pipeline	1. Grounding Clamp on one side of separation 2. Second cable from grounding clamp on one side of separation	1. Grounding Clamp on other side of separation 2. Grounding clamp on pipe section to be removed or installed	Ensure clamps make contact with clean, bare metal. First cable shall be long enough to span the work area. Second cable shall be long enough to clear the hazardous area when removing or installing pipe section.
Drawing Samples from Pipeline	1. Attach alligator clip on one end of bonding cable (unbraided copper) to sample point on pipeline (i.e., pipe, valve)	1. Other end of bonding cable to alligator clip on metal sample container	
Draining Oil From Pipeline to Pan	1. Pipeline	1. Metal Drain Tray	For plastic drain trays, second end of bonding cable shall remain in contact with liquid being drained into tray at all times.

Loading or Off-loading at Sump Tank Locations	1. Object being loaded/off-loaded	1. Sump tank or piping connection at loading/off-loading Facility	For fiberglass sump tanks, attach second end to specified bonding point.
Dispensing from Bulk Drums to Secondary Container	1. Bulk Drum	2. Secondary Container	One container shall be grounded, and the other container bonded to the grounded container.
Removing accessory attachments from fixed facilities	1. Clean, bare metal on accessory attachment	1. Fixed Facility	Bonding cable shall be long enough to clear the hazardous area when removing attachments or span of work area when separating flanges.
	1. Flange	1. Flange	
Hydrovacing Near Underground Electrical Wires	1. Wand/Gun 2. Dig Tube 3. Mat # 1 4. Mat #1	1. Grounding Mat # 1 2. Grounding Mat # 2 3. Mat # 2 4. Hydrovac Truck	For distances greater than (>) 2m (6 ft.) from the Hydrovac truck, it may not be necessary to bond the mat to the truck (Step 4).

Note: Some tasks require more than one bonding cable. The numbers listed in this table represent steps to be taken for proper bonding (i.e., bond 1 to 1, and 2 to 2, etc.).

4.14 **Hot Work**

Prior to commencing Hot Work ensure:

- Hot Work has been added to the Safe Work Permit (SWP)
- all movable fire hazards are removed and combustible materials (e.g. oil, rags, gasoline, paper) are removed from the Hot Work area and placed a safe distance away from the Hot Work
- verification of a non-explosive environment with an Atmospheric Monitoring device
- ensure continuous monitoring of Hot Work area during Hot Work in Hazardous and Restricted Areas and after the Hot Work has been completed in accordance with the Fire Watch standards set out in section 4.31 of this manual
- if fire hazards cannot be removed, then guards shall be used to confine heat, sparks and slag
- fire extinguishers are in place as per section 4.16 of this manual

Monitor the environment during Hot Work to ensure an unknown or previously undetected flammable atmosphere does not develop.

A Safety Watch is required when engaged in certain Hot Work activities, including but not limited to:

- welding, flame cutting, arc-air gouging or grinding in Hazardous Areas or Restricted Areas
- any Hot Work on or around Open Systems
- any Hot Work where product or vapors are present

A Safety Watch shall be maintained after Hot Work is completed in accordance with section 4.31. The number of Safety Watches and the period of time a Safety Watch will be maintained shall be determined based on the Hazard Assessment and Applicable Legislation.

4.15 Cutting and Welding

When welding and cutting precautions shall be taken against exposure to:

- excessive ultraviolet radiation
- burns
- fire and/or explosion
- asphyxiation
- exposure to toxic gases
- fumes or dusts

If welding or cutting cannot be conducted safely, then it shall not be performed until safe to do so following a Hazard Assessment. Remove flammable materials and products from the immediate vicinity when cutting or welding.

Where required, use partitions to enclose welding and cutting activities. Before work begins, the welder, or welder's helper, shall ensure that no other Worker is at risk of exposure to the arc flash, cutting slag or the spark path. Ensure non-essential Workers are removed from the Hot Work area and are restricted from gaining unauthorized access.

Turn welding machines off at the end of each workday or when left unattended.

The ground return line from the work being welded shall:

- be a single cable rated for the load of the welding machine
- be in good condition
- only be clamped to the material being welded

4.16 Portable Fire Extinguishers

Workers may attempt to extinguish a fire only if safe to do so and if they are confident in their abilities to effectively extinguish the fire. If Workers cannot ensure their own safety or if there is a risk of being trapped in the fire, Workers shall immediately evacuate.

Select and install portable fire extinguishers in accordance with Applicable Legislation. Provide appropriate fire protection, taking into consideration the building structure (e.g. metal or wooden studs or ceiling tiles), potential fuel sources (e.g., parts cleaner, wooden cabinets, plywood walls or electrical panels), and occupancy hazards (e.g., lunchrooms). Inspect and maintain portable fire extinguishers according to Tables 1, 2 and 3.

A minimum guideline for fire extinguisher placement is as follows:

- 2 – 20 lb. ABC for any work done in Hazardous or Restricted Areas
- 1 – 20 lb. ABC for each work area within fenced locations
- 1 – 20 lb. ABC for each office and storage trailer
- 1 – 20 lb. ABC for each designated outdoor smoking area
- 1 –10 lb. (at a minimum) ABC for pickup trucks not carrying refueling fuel tanks
- 1 –5 lb. for ATVs and UTVs
- 1- 20 lb. fire extinguisher is mandatory within 22 m (75 ft.) of any work activity; including ROW restoration projects
- each portable fire extinguisher shall cover no more than 230 m^2 (2500 ft^2)

Unless specific instructions indicate otherwise, position portable fire extinguishers so that travel distance to the extinguisher from the working area is:

- ≤ 23 m (75 ft.) for Class A fires (e.g., wood, paper)
- ≤ 15 m (50 ft.) for Class B fires (flammable/combustible liquids)
- ≤ 23 m (75 ft.) for Class D fires

Distances for Class C fires (electrical) are based on the surrounding fire hazards (Class A or Class B).

Portable fire extinguishers for Class D hazards are required in work areas where combustible metal powders, flakes, shavings, or similarly sized products are generated at least once every two weeks.

Contractors shall supply any additional fire extinguishers as required by applicable fire codes and the Hazard Assessment. Contractors are expected to meet the minimum portable fire extinguisher requirements for work areas and equipment.

Portable fire extinguishers shall be:

- stored above the floor or ground (hand-held models), to prevent condensation and subsequent corrosion on extinguisher bases
- mounted in accordance with manufacturers' specifications when stored on vehicles or equipment, or where otherwise subjected to shock and vibration
- when placed outdoors, covered for protection

Regional and/or Project Office's shall have:

- one 10-lb to 20-lb dry chemical extinguisher inside each entrance door, rated according to the hazards in the building
- one 20-lb CO_2 extinguisher outside the entry to any room housing electronics (e.g., computer server room, UPS room, measurement room)
- one 10-lb to 20-lb dry chemical extinguisher in the boiler room, rated according to the hazards in the room

Pump Stations and compressor buildings shall have:

- one 20-lb or 30-lb dry chemical extinguisher immediately inside each compressor building or pump room/shelter
- minimum of one 20-lb or 30-lb dry chemical extinguisher in each manifold area
- one 15-lb carbon dioxide (CO_2) or 7-lb Halon extinguisher inside each control room door and in the hallway outside the switchgear cubicle door
- one 20-lb or 30-lb dry chemical extinguisher in the pump room, positioned so that the travel distance from anywhere in the pump room to the extinguisher is no more than 9 m (30 ft.)
- one wheeled extinguisher immediately inside or outside the most frequently used doorway of pump rooms/shelters; if two shelters are less than 15 m (50 ft.) apart, one wheeled extinguisher may be placed between the two shelters

Pipeline Maintenance (PLM) shall have accessible:

- two 20-lb or 30-lb dry chemical extinguishers to be taken to pipeline repair jobs (including natural gas venting operations); the extinguishers shall be strategically located upwind of the work being completed and be immediately accessible
- additional 20-lb or 30-lb dry chemical extinguishers strategically located in PLM and welding shops based on Hazards
- one 30-lb ABC dry chemical extinguisher at each door and strategically located in work and welding shops

Remote maintenance bases should have:

- four 20-lb or 30-lb dry chemical extinguishers to be taken to Worksites as needed, based on the Hazard Assessment at each site

For Regional Operations remote locations that do not have ready access to fire extinguishers, refer to Table 4 for the amounts of fire extinguisher supplies that should be maintained. If recommended amounts are not maintained, a current list of supplies shall be kept on file. If a Worksite has access to a 24-hr. supply source, supplies kept on-site are at the discretion of the Operations Management. Worksites with ABC-rated fire extinguishers shall establish access to a supply of ABC dry chemical extinguishing agent. Dry chemical extinguishers stored or used outside during winter conditions should be equipped with nitrogen gas cartridges rather than carbon dioxide gas cartridges.

For information on Fixed Extinguishing Systems (e.g., CO_2, Halon, fixed hydrant) please see the Fire Protection, Extinguishment Engineering Standard.

Table 1 Inspection Frequency for Fire Suppression Equipment

Type of Equipment	Inspection Frequency
portable fire extinguishers (hand-held)	• monthly • when placed in service • after repairs and use
portable fire extinguishers (wheeled)	• monthly • when placed in service • after repairs and use
fixed systems (hydrant systems)	• annually • when placed in service • after repairs and use
fixed systems (CO_2 and Halon systems)	• annually (minimum)[1] • monthly (visual inspections)[2] • semiannually (for high-pressure cylinders) [3] • when placed in service • after repairs and use
foam trailers	• monthly[4] • when placed in service • after repairs and use

NOTES

1. A Qualified service contractor shall inspect and test systems annually.
2. A Site Supervisor shall visually inspect systems monthly.
3. A Qualified service contractor shall inspect high-pressure cylinders semiannually. During the inspection, cylinders shall be weighed and the date of the last hydrostatic test noted. Any container that shows a loss in net content of more than 10% shall be refilled or replaced.
4. Each region/area shall assign a Qualified employee to inspect foam trailers using the Foam Trailer Check Sheet.

Table 2-Maintenance Frequency for Portable Fire Extinguishers

Extinguisher	Maintenance Frequency	Hydrostatic Test Frequency
cartridge-type dry chemical extinguishers stored on vehicles	• annually • if evidence of corrosion or mechanical damage	every 12 years
cartridge-type dry chemical extinguishers stored in buildings or outdoors	• annually, not to exceed 365 days • if evidence of corrosion or mechanical damage	every 12 years
CO_2 extinguishers	• conductivity test annually on all CO_2 hose assemblies • whenever evidence of corrosion or mechanical damage found on tank	every 5 years
Rechargeable Stored Pressure Extinguishers[1]	• every 6 years[2]	every 12 years
Halon stored pressure extinguishers	• if evidence of corrosion or mechanical damage	every 12 years
liquid-charged AFFF foam extinguishers	• every 3 years • if evidence of corrosion or mechanical damage	every 5 years
wheeled fire extinguishers	• annually • if evidence of corrosion or mechanical damage	every 12 years

NOTES

1. Non-rechargeable stored pressure extinguishers are not internally inspected or hydrostatically tested. These extinguishers are removed from service at a maximum interval of 12 years from the date of manufacture, or sooner when exhibiting signs of corrosion or mechanical damage.
2. Rechargeable stored pressure extinguishers shall be emptied and subjected to the applicable internal examination procedure as outlined in the manufacturer service manual and NFPA 10.7.3.

Table 3-Hydrostatic Test Frequency for Cartridges and Cylinders

Cartridge/Cylinder	Hydrostatic Test Frequency
nitrogen cartridges on hand-held extinguishers	exempt (CAN), every 10 years (USA)
Ansul CO_2 cartridges on hand-held extinguishers	exempt
nitrogen cylinders on wheeled fire extinguishers	every 5 years

Table 4 Stock Amounts—Fire Extinguisher Supplies

Location	Supplies	Minimum Quantity[1]
Attended pump station	Purple K	500 lb
Pump station—ENB (NW)	ABC, Plus 50 or Purple K	500 lb
Delivery location and electric station with 150-lb extinguisher(s)	Purple K	200 lb
PLM shop or designated location	Purple K	500 lb
Remote maintenance base—ENB (NW)	ABC, Plus 50 or Purple K	200 lb
Worksite with 350-lb nitrogen extinguisher(s)	nitrogen cylinders/cartridges	1
Worksite with 150-lb nitrogen extinguisher(s)	nitrogen cylinders/cartridges	1
location with 20-lb or 30-lb nitrogen extinguisher(s)	nitrogen cylinders/cartridges	half as many as extinguishers in outdoor use (2 minimum)
location with 4-lb, 10-lb, 20-lb, or 30-lb CO_2 extinguisher(s)	CO_2 cartridges	half as many as extinguishers in indoor use

NOTES

1. or as determined by the Operations Management at their discretion

4.17 Fire Prevention and Protection

Take all necessary precautions to prevent fires, including, but not limited to, the following:

- eliminate/control ignition sources
- collect and secure garbage daily until it can be properly disposed
- store fuels, volatile solvents or any other flammable substances in containers that are clearly labeled, approved for their contents and located in a safe place away from ignition sources
- ensure flammable liquid containers are electrically bonded when liquids are being transferred from one to another
- flammable substances and quantities of chemical in excess of that needed for one day's work shall be stored in an approved storage Facility, isolated from the actual work areas
- post visible signs stating "NO SMOKING OR OPEN FLAMES WITHIN 8 METERS (25 FEET) OF THIS AREA" in areas where flammable substances are stored or used
- guard against clothing becoming contaminated with flammable liquids
- clean up spills promptly
- store and dispose of oily rags in approved containers of not more than 5 gallon capacity with self-closing lids designed to relieve internal pressure when subjected to fire exposure
- implement other fire prevention controls based on an assessment of the hazards

A fire protection plan may be required based on the potential fire hazards.

Projects shall prepare a fire protection plan to prevent wildfires within or adjacent to the work areas. The plan shall contain effective prevention and control measures to

address the potential for uncontrolled fires during Hot Work activities. Such measures may include the following:

- controlling smoke and open flames
- controlling sparks from construction equipment and welding or grinding operations
- position fire suppression and other special equipment close to the Worksite and/or consulting with local fire departments about emergency response arrangements
- providing fire extinguishers of appropriate size and type

Burning shall not be permitted on Enbridge property or ROW without prior authorization from the Operations Regional Manager or Construction Manager or designate. Green Field burning is to be conducted in accordance with all regulatory requirements. When authorization to burn has been received, complete the following:

- Submit a detailed Hazard Assessment for approval prior to the commencement of burning
- obtain a burning permit from the Authority Having Jurisdiction prior to commencement of burning and follow Applicable Legislation
- provide a continuous Safety Watch for at least 1 hour after the fire is completely extinguished
- supply a minimum of two 30 lb. (or 4 – 20 lb.) ABC dry chemical fire extinguishers that are readily available

For the location of facility fire suppression equipment, see the location’s Site Safety Plot Plan.

4.18 Entering Buildings Containing Natural Gas Products or Equipment

Buildings containing natural gas are provided with fixed gas detection equipment that is equipped with an alarm. The alarm will be triggered at the following concentrations of natural gas:

- 20% of LEL – low level alarm (audible and visible)
- 40% of LEL – high level alarm (audible and visible); results in an emergency shutdown

If the alarm for a fixed gas detection system has been triggered, conduct initial Atmospheric Monitoring from outside the compressor building, if possible.

Before entering any buildings where natural gas is present, operate valves as necessary to shut down or bypass the source of gas and/or ventilate the building (e.g., open doors and windows).

The minimum entry criteria for entering buildings containing natural gas products or equipment are:

- at <10% LEL, entry is allowed
- at 10-20% LEL, entry is allowed if:
    - only cold work is planned
    - Safety Watch is present at all times
- at >20% LEL, entry is allowed for inspecting or opening and closing valves to reduce gas levels provided:
    - a Safety Watch is present at all times monitoring atmospheric levels
    - a safety harness and lifeline are used and an employee trained in their use is present and in control of the lifeline
    - self-contained breathing apparatus (SCBA) or a supplied-air respirator (SAR) with egress bottle is used

Conduct continuous Atmospheric Monitoring while approaching the work area to verify acceptable conditions. If concentrations are higher than prepared for, exit the area and reassess the situation.

4.19 Vehicles, Equipment and Tool Use, Maintenance and Inspection

Ensure that all vehicles, equipment and tools are inspected, maintained and used according to Enbridge requirements, manufacturers' specifications and Applicable Legislation.

Any vehicles, equipment or tools that are found to have defects or malfunctions shall be tagged "Do Not Operate" and removed from service. Isolate all Hazardous Energy prior to servicing, maintaining or inspecting equipment.

Refer to manufacturers' weather and temperature limitations for equipment prior to use in extreme weather conditions.

Only Qualified Workers shall perform maintenance activities on tools and equipment. Tools and equipment that specify that they shall be returned to the supplier or manufacturer for service, repair, calibration or adjustment shall be returned at the required intervals.

All Contractor equipment dispatched to an Enbridge Location shall be in good working order and have the relevant operation, testing and maintenance records, plus maintenance instructions. These records may be requested by Enbridge

representatives prior to the equipment being used at Enbridge Locations, or at any time.

4.20 **Ladder Safety**

Ladders shall:

- be inspected before and after each use for any cracks or defects; if defective, repair immediately, or tag and remove from service
- not be used to form a walkway between two platforms or surfaces
- not be erected on boxes, carts, tables, or other unstable surfaces
- be carried horizontally below shoulder level
- have the proper weight rating for the task

Ladders shall be inspected periodically and after any occurrence which could affect their safe use. Such inspections shall be done by a Qualified Worker.

If a job-site constructed ladder is defective, repair it immediately. All other defective ladders shall be tagged and removed from service.

Workers using ladders shall:

- always face the ladder when going up, down, or performing any work activity
- maintain a three-point contact at all times when climbing or descending
- ensure the ladders footings are placed on a firm and level base
- not use items such as chairs, barrels, or boxes in place of a ladder
- carry small articles in pockets or in a belt
- use Fall Protection when working from ladders at heights greater than 2 m (6 ft.) when it is not possible to maintain three-point contact, unless the ladder is situated directly in front of the work and the Worker does not need to lean to conduct the task
- use the proper type of ladder best suited for the job
- used only non-conductive ladders in or around electrical cubicles, switchgear rooms, or when working on any electrical installation
- not climb beyond the 3rd last step or rung from the top of a ladder
- not straddle the space between a ladder and another object
- set up barricades and warning signs when using a ladder in a doorway or passageway
- barricade, lock or otherwise secure immediately adjacent doors prior to working on a ladder
- lift or lower larger articles from elevated locations by a hand line or a hoist
- have ladders above 2 m (6 ft.) held by a person when it is not secured
- secure ladders at the base, when a kick-out hazard exists

To mitigate the hazards potentially involved when using ladders over 2 m (6 ft.) in height, consider using alternatives such as scaffolding, work platforms or elevating devices.

Step ladders shall:

- be placed at right angles to the work
- not be used to brace or support work
- not have either of the top two rungs used as a step
- be used as per manufacturers' specifications

Extension ladders shall:

- have the base of the ladder placed at a 4 to 1 operating angle
- extend at least 1 m (3 ft.) above the landing platform
- be tied off at the top of the ladder to prevent it from slipping or being moved or blown over
- have slip-resistant footing
- be climbed by grasping the rungs, not the side rails
- be erected so that the upper section rests on the bottom section maintaining the minimum overlap of sections as shown on the ladder label
- have the locking ladder hooks secure before climbing

Constructed job-site ladders shall meet or exceed Applicable Legislation for the type of work required.

4.21 Walkways, Stairways, Exits, Landings and Openings

Walkways shall be designated and kept clear of hazards, debris, snow and ice.

Stairways, landings and exits shall:

- have hand and guard rails when over 1.3 m (4 ft.)
- comply with Applicable Legislation including building codes

All floor, walkway, vault, handrail and ground openings that present a fall hazard of over 1.3 m (4 ft.) shall be properly marked and guarded when Workers could be present.

Exposed duct banks and conduit shall not be used as walkways.

Building exits shall be marked and shall have emergency lighting where required by Applicable Legislation.

4.22 Scaffolds and non-mobile Elevated Work Platforms

Workers using scaffolds, Swing stage scaffolds and non-mobile elevated work platforms shall use Personal Fall Protection systems when working at heights greater than 2 m (6 ft.) without proper guardrails.

Workers shall not:

- sit or climb on the edge of the Swing stage, work cage or scaffold handrails
- use ladders, unsecured planks or other devices as a work platform

Workers shall:

- check the scaffold inspection tag prior to use to ensure the scaffold is fit for the intended use
- lift or lower larger articles from elevated locations by a hand line or a hoist

Scaffolds shall:

- be installed, inspected, maintained, and repaired in accordance with the manufacturers' specifications and Applicable Legislation
- be erected and dismantled under the supervision of a Qualified person, competent in their construction and use
- be erected plumb to ensure maximum structural capacity of the system
- have a maximum height of three times the minimum base width unless additional stabilizing supports are used
- have a Qualified person confirm that the scaffold is erected properly and attach an inspection tag (which includes the load rating) prior to allowing work to commence
- use components and planking that are in good repair

If the scaffold is higher than 15 m (50 ft.), it shall be designed by a professional engineer, and erected, used and maintained in accordance with the engineered design.

Workers who are involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold shall be trained to recognize any hazards associated with the work.

All Workers who perform work while on a scaffold shall be trained by a Qualified person to recognize the hazards associated with the type of scaffold being used and to understand the procedures to control or minimize those hazards.

When erecting and dismantling supported scaffolds, a Qualified Worker shall ensure that all fall protection requirements are met and that a safe means of access is provided.

Scaffold components shall meet all Applicable Legislation as well as the following requirements set out in this manual:

- scaffold bases shall:
    - be set on level and compacted soils
    - have base plates (preferably with screw jacks to allow for adjustment) and should rest centrally on mudsills
    - have mudsills continuous under at least two consecutive end frames or supports
    - have mudsills that are not constructed by joining smaller pieces of wood together
    - have blocks under supports for wedging and bridging
    - not have a smaller dimension than 1/3 of the height of the scaffold without outriggers
    - have outriggers on base plates, fastened at approximately 1/3 of the total height when required
    - have bridging that is secured in place, when bridging is required
- scaffold supports and bracing shall:
    - be securely fastened in accordance with manufacturers' specifications
    - have all structural members in place
    - have all cross braces in place

    - be tied or secured to a building or other structural supports if the height exceeds 3 times the smallest base dimension
    - increase the number of ties if hoarding/enclosure is used in windy conditions or if there are other dynamic loads caused by the work being done on the scaffold
    - have ties that are placed as the scaffold is being erected
- scaffold planking shall:
    - be manufactured scaffold planks that are used, stored, inspected and maintained according to manufacturers' specifications; or solid sawn lumber planks that are rated as scaffold grade or better
    - be visually inspected before installation
        - subject the plank to a load test if the visual inspection reveals damage that could affect its strength or function
    - extend the required distance from the support and overlap as required
    - be secured to prevent movement in any direction
- scaffold platforms shall:
    - be identified as light or heavy duty
    - be fully planked between the front uprights and the guardrail system
- scaffold guardrails shall:
    - be installed on all platforms above 1.2 m (4 ft.)
- scaffold toe boards shall:
    - be used on the outer edges and the ends if the height of the scaffold planking is greater than 2 m (6 ft.)
- scaffold ladders shall:
    - be installed as the scaffold is being built
    - shall extend 1 m (3 ft.) above the top of the scaffold platform and shall be secured at the top when using portable and built-in ladders
    - portable ladders shall:
        - be secured at the bottom or tied to the scaffold at waist height and flagged

Internal stairways or built-in ladders are required for scaffolds greater than 9.1 m (30 ft.) high.

Attachable vertical scaffold ladders exceeding 6.1 m (20 ft.) in height shall be equipped with one of the following:

- a safety cage that complies with Applicable Legislation
- proper fall protection
- rest platforms

Workers shall not climb braces or end frames.

Using equipment to hoist Workers to a work area is prohibited unless it is demonstrated that conventional means would be more hazardous, or that conventional means would not be possible because of the project's structural design or Worksite conditions. (In this case conventional means refers to the erection, dismantling and/or use of means such as ladders, stairways, scaffolds, personnel hoists, aerial lifts or elevating work platforms.)

Swing stages or suspended scaffolds, work cage platforms and man baskets shall:

- not exceed the Manufacturer's Rated Working Load
- have the manufacturer's platform load rating clearly labeled and visible to all Workers

- be installed by a Qualified Worker
- have rigging hardware (e.g., hooks, shackles, rings, bolts, slings, chains, wire ropes, splices) capable of supporting at least 10 times the rated capacity of the maximum load to which it may be subjected
- use wire rope suspension lines that are free of kinks, birdcaging, excessive wear, broken wires, flat spots and other defects

When used for hoisting Workers, Swing stage or suspended scaffolds, work cage platforms and man baskets shall be designed and certified by a professional engineer. A copy of the certification, equipment drawings, and the most recent inspection certificate shall be available upon Enbridge's request

Swing stages require a redundant system for control (such as a deadman switch/pedal or tandem operation) and properly sized and secured hangers or stirrups.

For work cages, when it is not practicable to provide a separate personal fall arrest system using a vertical lifeline for each worker in the work cage, then there shall be a separate support attached between the work cage and the hoist line. The support shall be above the hook that is capable of holding the weight of the work cage and any potential contents.

Non-Mobile Elevated Work Platforms

All non-mobile elevated work platforms shall be equipped with:

- handrails
- midrails
- toeboards
- skid-resistant working surfaces
- wire mesh from the top rail to the toeboard if required by the Hazard Assessment

When Swing stages and work cages are being used, emergency rescue procedures shall be documented in the fall protection plan or critical lift plan and communicated to all Workers.

4.23 Safeguards, Barricades, and Warning Signs

Unprotected temporary openings in floors or elevated work platforms shall:

- be covered with plywood that is at least ¾ of an inch in thickness
- have secured coverings capable of supporting twice the maximum intended load
- only be removed to perform a particular task

Coverings shall only be removed to perform a particular task. Coverings shall be replaced immediately after the task is complete or as appropriate during the task if other Workers are present near the work area.

Suitable safeguards, flagging or barricades with warning signs or flashing lights shall be used to protect Workers from any work activity that may endanger them. Examples of such activities include sand blasting, open excavations, temporary openings in floors, construction, arc flash in pre-fab areas, pressure testing or overhead work.

Barricades shall be inspected periodically to ensure protection for Workers is adequate, and that barricades are still present and in good condition.

Flagging shall be used as a warning to Workers of hazards that exist in work areas. Flagging tape shall be:

- installed to completely encompass the work area containing the potential hazard, including access from levels above or below
- prominently placed when conditions or activities may or do present a hazard to Workers or the public
- placed to ensure Workers cannot enter the area where the hazard exists, without prior knowledge of the hazard
- removed when the potential hazard no longer exists

Workers shall not enter flagged or barricaded areas until they:

- obtain permission to enter from Workers in control of the area
- understand the hazards within the area
- take necessary safety precautions

The following types of flagging shall be used:

- RED – "Danger Do Not Enter" – Red with black lettering. This type of flagging is used where there is danger of an imminent hazard, such as falling objects. Only Workers involved in the work and aware of the hazards are allowed in these areas. All others must obtain prior permission from the flagging owner (i.e., Worker who installed the flagging).
- YELLOW – "Caution" – Yellow with black lettering. This type of flagging provides a warning that a hazard exists in the area. Yellow flagging can be crossed by workers other than those who installed it, but awareness of the surrounding work areas is required

A flagging tag shall be attached to all flagging tape. Multiple tags may be required depending on work area and hazards. The Worker installing the tape shall complete the tag with the following information:

- name of the person who installed the flagging
- phone number or radio channel for contact
- date on which the flagging was installed
- reason for the use of flagging

Instead of flagging and barricades a Safety Watch may be used to prevent Workers from entering the hazardous area, but only if the area is small enough to be easily managed and the Safety Watch remains in place until the hazard no longer exists.

Warning signs identifying known hazards shall be posted to warn Workers and others in the area of the specific hazard. All signs shall be constructed in a professional manner and shall meet Applicable Legislation and Enbridge's design and installation Standards, which are be found in the Engineering Standards (IMS-08).

Warnings signs include, but are not limited to:

- Directional Signs
    - Installed as required
- No Trespassing/Open Ditch
    - The signs shall be:

        - posted at all entries to the ROW
        - face the intersecting road/highway, where construction activities are being conducted
        - display a contact telephone number for unauthorized Workers to contact
- Construction Warning Signs
    - All crossings of any Interstate, Highway, municipal or private roads shall be posted with construction warning signs, which are designed and positioned in accordance with the requirements of the Applicable Legislation. Such signs shall be clearly visible to traffic, as appropriate to the crossing, e.g., visible from two or more directions
- High Pressure Testing Signs
    - Shall be posted:
        - at all entries to the ROW, public access points, while sections are under test
        - facing intersecting roads/highways
- Smoke Warning Signs
    - Warning signs shall be used to warn traffic of poor visibility due to smoke from brush burning operations. All such warning signs shall be in accordance with Applicable Legislation
- Other Warning Signs shall be erected as required by Applicable Legislation or by Enbridge to warn workers and/or the public of a range of potential hazards such as:
    - traffic hazards (e.g., STOP, slow, curve, steep hill, noise hazards, caution, work crews ahead, suggested speed restrictions, trucks turning, work in/over navigable waters)
    - signs indicating venting in progress during any venting activities (like opening pig traps)
    - “Caution: Open Hole” or similar when there is an opening
    - overhead hazards
    - respiratory hazards
    - other PPE requirements (e.g., hard hat, hearing protection, eye protection required)

4.24 **Brush Cutting**

When using motorized equipment for cutting or clearing brush, Workers shall:

- check the cutting area for any metal, large stones or other hard material that could damage the blades or cutter disc
- regularly clean accumulated debris from the top of the cutter’s fuel tank and from the engine, pumps and axle protection plates on a regular basis
- ensure other Workers do not approach the brush cutter’s articulating joint when the brush cutter is operating
- operate brush cutters with protective guards installed
- wear additional PPE as required by the Hazard Assessment
- ensure each brush cutter has protective guards and only operate brush cutters with the guards installed
- dispose of brush and slash by mulching and spreading on an area designated by the regional/project manager or an Enbridge ROW agent or landowner

A Worker shall not operate a brush cutter when other workers are within 150 m (500 ft.) of the front or sides of the brush cutter (see manufacturers' recommendations).

Brush cutting is a Ground Disturbance activity when it meets the criteria in the Ground Disturbance definition. Ground Disturbance precautions shall be in place prior to beginning brush cutting.

4.25 **Severe and Inclement Weather**

Workers shall check and monitor weather reports prior to issuing and approving permits. Permits suspended due to inclement weather shall be revalidated once weather conditions improve.

If potential or imminent severe weather is forecast, the hazards due to severe weather need to be identified and controls implemented. Controls can include, but are not limited to:

- have Workers work remotely
- send Workers home from Enbridge Locations to avoid travel in severe weather
- close offices and Worksites

Severe weather considerations include:

- lightning
    - take shelter when thunder is heard; work shall not recommence until 30 minutes after the final observation of thunder
    - when an electrical storm is visible from the Worksite, the following work shall be stopped: all testing or grounding for mitigating induced voltage; work in or around structures (e.g., tanks, side-booms, cranes, dozers, etc.); work outside of compressor/pump buildings; work on ROWs
    - where practicable, use lightning detectors to supplement visual and auditory detection of electrical storms; use the detector's specifications to determine detection ranges and action plans
- heavy rain
    - avoid driving on flooded access roads or ROWs
    - avoid crossing bridges if water level is high and fast flowing
    - stay out of trenches, excavations and below ground level unsheltered entry points
- hail/freezing rain:
    - take cover during hailstorms
    - expect slippery walking and driving conditions
    - be aware of possible damage to trees and power lines due to ice buildup
    - avoid travel in these conditions
- extreme heat/heat stress guidelines
    - consult the climatic condition reports from your local weather service during Hazard Assessment
    - apply the correction factor and repeat the Hazard Assessment process whenever climatic conditions change more than +/- 5 ^{o}F or ~+/-3 ^{o}C (see Table 1)
    - determine the amount of cloud cover, the exertion level of the work being conducted and the type of clothing being worn to calculate the correction factor (Table 2)
    - reduce the physical demands of work (e.g., excessive lifting, digging with heavy objects)
    - provide recovery areas (e.g., air-conditioned enclosures, rooms for rehydration)

- use shifts (e.g., early morning, cool part of the day, night work)
- use relief Workers
- use worker pacing
- take steps to protect workers from exposure to UV radiation such as sunscreen, PPE, and clothing with UV protection and wide brims
- assign extra Workers and limit worker occupancy or the number of Workers present, especially in confined or enclosed spaces
- train Workers to recognize the signs and symptoms of heat stress; and to know and follow heat stress prevention measures
- provide water nearby on the Worksite (Workers should drink about one cup of water every 20 to 30 minutes, even if they are not thirsty)

Table 1-Heat Index from Temperature and Relative Humidity Readings*

Relative Humidity	**Actual Temperature °F (°C)**								
	70 (21.1)	**75 (23.9)**	**80 (26.7)**	**85 (29.4)**	**90 (32.2)**	**95 (35.0)**	**100 (37.8)**	**105 (40.6)**	**110 (43.3)**
0%	70 (21.1)	75 (23.9)	80 (26.7)	85 (29.4)	90 (32.2)	95 (35.0)	100 (37.8)	105 (40.6)	110 (43.3)
10%	70 (21.1)	75 (23.9)	80 (26.7)	85 (29.4)	90 (32.2)	95 (35.0)	100 (37.8)	105 (40.6)	110 (43.3)
20%	70 (21.1)	75 (23.9)	80 (26.7)	85 (29.4)	90 (32.2)	96.8 (36.0)	102.2 (39.0)	109.4 (43.0)	116.6 (47.0)
30%	70 (21.1)	75 (23.9)	80.6 (27.0)	87.8 (31.0)	95 (35.0)	102.2 (39.0)	109.4 (43.0)	118.4 (48.0)	125.6 (52.0)
40%	70 (21.1)	77.0 (25.0)	84.2 (29.0)	91.4 (33.0)	98.6 (37.0)	107.6 (42.0)	116.6 (47.0)	125.6 (52.0)	
50%	71.6 (22.0)	80.6 (27.0)	87.8 (31.0)	95 (35.0)	104 (40.0)	113 (45.0)	122 (50.0)		
60%	75.2 (24.0)	82.4 (28.0)	91.4 (33.0)	98.6 (37.0)	109.4 (43.0)	118.4 (48.0)	129.2 (54.0)		
70%	77.0 (25.0)	86 (30.0)	95 (35.0)	104 (40.0)	113 (45.0)	123.8 (51.0)			
80%	80.6 (27.0)	87.8 (31.0)	98.6 (37.0)	107.6 (42.0)	118.4 (48.0)				
90%	82.4 (28.0)	91.4 (33.0)	100.4 (38.0)	111.2 (44.0)	122 (50.0)				
100%	84.2 (29.0)	95 (35.0)	104 (40.0)	114.8 (46.0)	127.4 (53.0)				

* This table is based on: working conditions with little or no radiant heat; Workers wearing regular summer clothing; un-acclimatized Workers doing moderate work or acclimatized Workers doing heavy work.

Table 2 -Correction Factor (in 0F) for Radiation Heat, Clothing, and Workload

Clothing	100% cloud cover	60% cloud cover	30% cloud cover	0% cloud cover	Work Type
FR + Vest	1	2	4	4	Light work
	2	3	4	5	Moderate work
	4	4	7	8	Heavy work
FR + Regular Tyvek[1] + Vest	4	6	8	9	Light work
	6	8	9	11	Moderate work
	9	10	12	15	Heavy work

**The numbers in Table 2 indicate an increase in the heat index as a correction factor to reflect cloud coverage, clothing and type of work. For example; performing heavy work with FR clothing + vest with 100% cloud coverage would add 4°F to the heat index to obtain the final heat index. The work rest schedule would have to be determined based on the final heat index.

[1] Regular Tyvek suit is made of polypropylene. This is considered a breathable fabric. (Chemical resistant suits are coated with polyethylene. This type of garment is impermeable with no breathability.)

- extreme cold guidelines
  - wear layers of warm clothing and cover as much exposed skin as possible
  -
  - train Workers to recognize signs and symptoms of cold related conditions in other Workers
  - take 10 minute warm up breaks as required by Table 3, calculating for wind chill (Note that these TLVs are applicable to Workers in dry clothing)

Table 3-TLVs Work/Warm-up Schedule for Outside Workers based on a 4-Hour Shift

<table>
<tr><td colspan="2">Air Temperature – Sunny Sky</td><td colspan="2">No Noticeable Wind</td><td colspan="2">5 mph (8 km/h) Wind</td><td colspan="2">10 mph (16 km/h) Wind</td><td colspan="2">15 mph (24 km/h) Wind</td><td colspan="2">20 mph (32 km/h) Wind</td></tr>
<tr><td>°C (approx)</td><td>°F (approx)</td><td>Max. Work Period</td><td>No. of Breaks**</td><td>Max. Work Period</td><td>No. of Breaks</td><td>Max. Work Period</td><td>No. of Breaks</td><td>Max. Work Period</td><td>No. of Breaks</td><td>Max. Work Period</td><td>No. of Breaks</td></tr>
<tr><td>-26° to -28°</td><td>-15° to –19°</td><td colspan="2">(Norm breaks) 1</td><td colspan="2">(Norm breaks) 1</td><td>75 min.</td><td>2</td><td>55 min.</td><td>3</td><td>40 min.</td><td>4</td></tr>
<tr><td>-29° to -31°</td><td>-20° to –24°</td><td colspan="2">(Norm breaks) 1</td><td>75 min.</td><td>2</td><td>55 min.</td><td>3</td><td>40 min.</td><td>4</td><td>30 min.</td><td>5</td></tr>
<tr><td>-32° to -34°</td><td>-25°to –29°</td><td>75 min.</td><td>2</td><td>55 min.</td><td>3</td><td>40 min.</td><td>4</td><td>30 min.</td><td>5</td><td colspan="2" rowspan="4">Non-emergency work should cease</td></tr>
<tr><td>-35° to -37°</td><td>-30° to –34°</td><td>55 min.</td><td>3</td><td>40 min.</td><td>4</td><td>30 min.</td><td>5</td><td colspan="2" rowspan="3">Non-emergency work should cease</td></tr>
<tr><td>-38° to -39°</td><td>-35° to –39°</td><td>40 min.</td><td>4</td><td>30 min.</td><td>5</td><td colspan="2" rowspan="2">Non-emergency work should cease</td></tr>
<tr><td>-40° to -42°</td><td>-40°to –44°</td><td>30 min.</td><td>5</td><td colspan="2" rowspan="2">Non-emergency work should cease</td></tr>
<tr><td>-43° & below</td><td>-45° & below</td><td colspan="2">Non-emergency work should cease</td></tr>
</table>

*2013 TLVs and BEIs – Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: American Conference of Governmental Industrial Hygienists (ACGIH), 2013-page 202

- high wind
    - when wind conditions exceed 50 km/hr (30 mph) or more, the Hazard Assessment shall be reviewed and adjusted to take the wind conditions into consideration, or the activity shall be suspended until wind conditions are more favorable
    - consider other hazards such as dust and debris, secure any loose materials
- geographic work locations that can be prone to earthquakes, hurricanes and/or tornados

Refer to existing emergency management plans for guidance in specific severe weather conditions.

4.26 **Work in the Dark**

Work after dusk shall not be permitted unless the following conditions are met:

- For Contractor work, prior approval shall be obtained from the Enbridge Representative
- there is a minimum of two (2) Workers, or communications exist to outside areas to request assistance if required
- adequate lighting is provided to illuminate the work
- regular “night shift” work shall require prior project approval

Night security Workers shall:

- not work alone, unless they have an adequate communication plan in place to contact other Workers or emergency assistance as needed
- maintain communications and check in at least every two hours with a control room or other Workers familiar with the Worksite and the Emergency Response Plan for that project and/or operating facility

4.27 **Extended Hours**

The Contractor shall submit an “After Hours Work Plan” to the Site Inspector or Site Supervisor prior to any extension of regular work hours or the addition of an extra shift. This plan is intended to be used when Contractors are required to work after regular hours in the absence of an Enbridge Representative. This plan does remove the requirement for a Contractor to have a Working Alone Policy.

The Site Inspector shall review and authorize the plan to ensure adequate coordination of the activities, and to ensure that emergency response and security issues have been addressed. Operations Management shall approve extended work hours within an operating Facility.

4.28 **Fatigue Management**

Regional, Department or Project Management shall implement a fatigue management plan when Workers are at an increased risk from fatigue-related effects. The fatigue management plan shall consider:

- extended length of shift worked (beyond 12 hours)
- extended consecutive days worked (beyond 10 consecutive days)
- extended travel time to and from the Worksite (total work day, including travel, exceeds 14 hours)
- excessive physical effort required as part of normal work activity
- environmental extremes (e.g., heat, cold, noise, vibration, lighting)

The fatigue management program should consider the following:

- identification of the factors that lead to fatigue
- assessment of the risks associated with the factors that contribute to fatigue
- identification of control measures to manage exposure to fatigue
- implementation of the selected control measures
- rehabilitation/return to work
- management approval processes

Contractors shall provide advanced notice to the Enbridge Representative of work that falls under the fatigue management plan.

4.29 **Sanitary Facilities**

Regional, Department or Project Management shall:

- provide adequate sanitary facilities at the Worksite for the size and type of Workforce to be employed
- provide Workers with sufficient drinking fluids and provide access to toilets and hand washing facilities in accordance with Applicable Legislation

Workers shall:

- use the facilities provided
- ensure that all facilities are adequately serviced and properly stocked
- ensure facilities are adequately secured

4.30 **Abrasive Blasting**

All Workers engaged in abrasive blasting activities shall be trained and Qualified to perform their assigned tasks, duties and responsibilities. This includes but is not limited to the operator, the attendant and the safety watch.

Notification of abrasive blasting work shall be submitted to the appropriate agency or Authority Having Jurisdiction, in accordance with Applicable Legislation.

Only Enbridge approved abrasive blast media shall be used. Recycled glass-based media is recommended. Abrasive blast media containing crystalline silica shall not be used.

The entity performing the work (i.e., Enbridge or the Contractor) shall use reasonable efforts to collect spent abrasive blast media and is responsible for collecting, storing, testing, and disposing of spent abrasive blast media in accordance with the Waste Management Plan. The entity performing the work shall contact the Enbridge Environment Department for assistance in obtaining the approved disposal methods, record retention requirements and approvals. The records shall contain the type and volume of abrasive blast media, laboratory results and disposal location.

Equipment shall be inspected daily before use, including testing of safety shutdown and control (deadman) switches. Inspection details shall be documented. Safety shutdown and control (deadman) switches shall not be disabled for any reason.

Intrinsically safe switches are to be used when applicable, or as determined by the Hazard Assessment.

Hoses shall have whip checks and clips/wires properly installed to prevent accidental decoupling. Whenever possible, do not place hoses and lines on main roadways or walkways.

The blast nozzle control (deadman) switch shall be located near the nozzle in a position where the operator's hands will be when using the device. When released, the control switch shall immediately stop the flow of material. The control switch shall be guarded, to prevent inadvertent activation. Abrasive blasting equipment used to clean tanks shall have the blasting hose nozzle bonded electrically to the tank shell or the tank roof.

Workers shall wear additional PPE as required by the Hazard Assessment to protect against exposure to high velocity abrasive matter, airborne respirable particulates (potentially contaminated) and noise.

Site Preparation/Work Control

- post warning signs within 15m (50 ft.) of the work area
- where the abrasive blasting will affect other Workers erect barricades or rope off area to warn workers and prevent access to work area
- only Workers equipped with the required PPE shall enter the work area
- Workers not directly involved in the abrasive blasting operation shall stay up-wind whenever possible
- conduct initial and continuous Atmospheric Monitoring in Hazardous and Restricted areas
- equipment and vehicles should be protected from debris projected from the work area
- do not allow abrasive blasting within 3 m (10 ft.) of any tank vent whether or not the vents are open, unless the tank has been cleaned and declared gas free by a Qualified Worker; if a tank has not been cleaned and declared gas free, clean areas within 3 m (10 ft.) of tank vents with hand tools such as scrapers, wire brushes and similar equipment
- when abrasive blasting for extended periods, a Worker rotation plan shall be implemented to reduce exposure time
- ensure the abrasive blast pot is shut off and depressurized before being filled
- do not re-use abrasive blast media
- provide a designated area for the removal of PPE separate from the lunch/office space to eliminate cross contamination; establish and practice personal hygiene Standards (e.g. wash before you eat)
- implement dust control/collection measures:
    - line the bottom of the work area with 4 mm (mil) polyethylene sheeting (contact the Environmental Department for alternatives to this requirement based on blasting media and project scope)
    - erect a shroud (e.g. tarpaulin) in densely populated areas, or if migrating dusts are problematic and/or as required by applicable regulations
    - consider using a portable air filtration system with High-Efficiency Particulate Air (HEPA) filter when using a shroud or in a Confined Space

- consider using a negative pressure HEPA filter exhaust system when blasting within a tank
- stop work and collect spent abrasive blast media as required

The operator shall:

- have the nozzle under control before the air is turned on
- not reposition from the immediate work area (e.g., lateral or vertical body movement) while discharging blasting media
- have control of the nozzle's control (deadman) switch
- When reasonably practicable, before leaving the worksite at the end of each day, remove and dispose of coveralls and shower where practical

4.31 Fire Watch and Safety Watch

The role of a Fire Watch or Safety Watch is to protect Workers by monitoring for hazards during a work activity. A Qualified Worker shall be assigned the Fire Watch or Safety Watch role and instructed on the scope of work. This Worker shall not be assigned or perform other duties.

If the Fire Watch or Safety Watch leaves the work area the work activity shall stop, unless there is another Qualified worker who can assume Fire Watch or Safety Watch duties.

The Fire Watch and Safety Watch shall have the ability to clearly communicate to the Workers under their care and access emergency response and Site Supervision as required.

One or more Fire Watches (also known as spark watches) may be required when Hot Work is being conducted, based on the Hazard Assessment.

If hot work is being conducted in a Hazardous or Restricted Area, then a Fire Watch is required and shall be maintained for at least one half hour after the work is completed.

In addition, when hot work is conducted within 15 m (45 ft.) of an area with flammable or combustible contents, the Fire Watch shall check the area four hours after the work is completed, and document the results, unless:

- all flammable and combustible materials within 15 m. (45 ft.) are removed from the hot work area, or lined with noncombustible materials
- an approved engineering weld procedure is used when conducting hot work activities on pipelines and tanks containing product

A Safety Watch is required when specified by the Hazard Assessment or Applicable Legislation. The person(s) planning and supervising the work shall assign a Safety Watch. The scope of the work and Hazard Assessment will determine the necessary qualifications for the Safety Watch position.

Examples of work activities where a Safety Watch may be required include:

- electrical
- open system
- emergency response

- drainup
- Working Excavations

At a minimum, the qualifications to be a Fire Watch or Safety Watch include:

- valid certification for mandatory safety training based on the scope of work
- the Worker shall be Qualified, knowledgeable and experienced relative to the scope of work, specifically the safety aspects

Additional qualifications such as a Journeyman Ticket may be required depending on the scope of work and the Hazard Assessment.

4.32 **Hydrostatic and Pneumatic Testing**

Testing activities shall be carried out in accordance with Enbridge requirements for Hazard Assessments, Open System work, test planning and site preparation, contract requirements and Applicable Legislation.

Where necessary, permits shall be obtained by Enbridge or the Contractor as specified in the contract between Enbridge and the Contractor. Copies of all permits shall be in the possession of the Contractor site supervisor as well as the Enbridge Site Inspector.

For Worksite(s) where a section of piping is being tested, an Enbridge Site Inspector shall be on-site. The Enbridge Site Inspector shall be Qualified and shall provide on-site coordination of the test plan and shall witness the test.

At the testing location:

- The piping being tested shall be fitted with approved enclosures at each end, i.e., test heads
- there shall be a safe means of access and egress for trenches, and properly installed scaffolding at the test heads
- there shall be adequate lighting when night work is necessary, and a fire extinguisher at both ends of a test section
- there shall be adequate heating and lighting facilities for test Workers located a minimum of 15 m (50 ft.) away from any testing facilities

Other requirements include:

- ensure that only the Workers directly involved in the testing are in the immediate vicinity of test heads, pressure pumps, or exposed piping during testing
- to prevent them from moving or violently separating, ensure temporary piping or hoses used during pressuring and depressurizing activities anchored or secured by such method(s) as whip check connections, steel braid line wrap, or staking to the ground
- ensure the use of appropriate hoses, piping, fittings, valves, etc., and that such equipment has an adequate pressure rating for the service; inspect the equipment before use, to ensure it is in good condition
- persons not directly involved in the testing shall be kept back a minimum of 30 m (100 ft.) from the pipeline, by the use of signs, fencing, and verbal warnings
- provide a safe means to release pressure from both ends of the piping section; pressure shall be released prior to loosening or removal of fittings

Hydrostatic Testing

Two zones shall be established around any hydro test; a 15 m (50 ft.) exclusion zone and a 30 m (100 ft.) zone. These requirements shall be followed during all hydro tests. Unique circumstances may require additional measures to ensure the safety of Workers and the public.

Whenever possible, expand the 15 m (50 ft.) zone requirements to the 30 m (100 ft.) zone dimensions.

If leaks are observed (through gauge drop or visual inspection) then the pressure must be reduced to zero PSI prior to entering the exclusionary zone. No adjustments of any kind are to be performed on pressurized piping.

Fuel containers, propane tanks, and other fuel storage shall not be permitted within the 15 m (50 ft.) zone. Testing trailers shall be parked with the entrance facing away from the test area. The testing trailer door(s) shall remain closed during testing operations. If it is necessary to test indoors, the 15 m (50 ft.) exclusion zone shall encompass the entire room in which the test is completed.

15 m (50 ft.) Zone (Exclusion Zone)

- The boundary of this zone shall be marked with red flagging, stating "Danger- Do Not Enter". All unnecessary equipment and workers shall stay out of this zone when the pipe is pressurized above normal operating pressures.
- Squeeze pumps, water tanks, and temperature recorders may be located in this zone. Temperature recorders and other equipment shall be checked prior to pressurization and 15 minutes after the pipe reaches full pressure. This will help keep the number of Workers in the area to a minimum during the critical pressurization time.
- Ensure the 15 m (50 ft.) zone applies over the entire length of the pipeline being tested. Note: Within populated areas, traffic control is required and shall be identified in the Hazard Assessment and as part of the SWP.
- Workers shall stay in their vehicles if they are within this zone monitoring the pipeline during the hydro test, with the exception of checking for leaks or opening or closing valves.
- Hydro test signs shall be placed on public access points and located at a point 15 m (50 ft.) from the pipeline.

30 m (100 ft.) Zone

- this zone will not be marked; the public and other Workers shall stay at least 33 m (100 ft.) away from the pipe
- this zone applies over the entire length of the pipeline section being tested
- the public shall be kept out, except when crossing the pipeline in vehicles
- Landowners along the right-of-way shall be notified in advance of the hydro-test and those living within the 30 m (100 ft.) zone shall be evacuated
- in the event piping and equipment is present in the test area or within 33 m (100 ft.), of the pressurized components, the area shall be flagged and remain off limits to all Workers during the test
- when testing trailers or vehicles are parked, extra precautions shall be taken (e.g., stage behind large equipment)

Pneumatic Testing

- adhere to Engineering's specifications for pneumatic testing
- both ends of the test section shall have a flange, test head, or trap welded to the pipe
- distinct warning signs shall be posted during air pressure testing, such as "DANGER, AIR PRESSURE TESTING IN PROGRESS"

4.33 **Pigging**

Pigging activities shall be carried out in accordance with, but not limited to the Hazard Assessment, Open System work and pipeline purging procedures, as well Applicable Legislation.

Where required, permits shall be obtained. Copies of all permits shall be in the possession of the Contractor site supervisor as well as the Enbridge Site Inspector.

For pigging, the following requirements apply:

- pipeline sections shall be fitted with approved enclosures at each end, e.g., sending and receiving traps
- only those Workers directly involved in pigging shall be allowed in the immediate vicinity of sending and receiving traps, pressure pumps, or exposed piping during pigging
- there shall be adequate heated and lighted facilities for pigging Workers, located a minimum of 15 m (50 ft.) away from any pigging facilities
- with the exception of vacuum truck hoses, temporary piping or hoses used during pressuring and depressurizing activities shall be anchored or secured by such method(s) as whip check connections, steel braid line wrap, or staking to the ground (such measures are to prevent piping or hoses from moving or violently separating)
- hoses, piping, fittings, valves, etc. shall have an adequate pressure rating for use during pigging
- ensure the area directly in front of the pig trap is flagged, to prevent persons from inadvertently walking or working within 15 m (50 ft.) of any pigging facilities
- ensure a safe means to release pressure from both ends of the section; pressure shall be released prior to loosening or removal of fittings
- Atmospheric Testing and Monitoring shall be performed to determine if SAR or SCBA are required and the level of protection needed
- full-mask respirators with the appropriate cartridges shall be worn be Workers prior to opening any valves for pigging
- if vacuum trucks are used, then their out-take hose shall be equipped with a stake and attached ribbon to indicate wind direction, plus a H_2S warning sign

4.34 Warehouse, Lay-Down and Storage Areas

Warehouse, lay-down and storage areas shall be designated as work areas where PPE is required. This includes hardhats, eye protection and safety footwear.

Additional PPE, such as hearing protection, may be required based on the Hazard Assessment.

All dangerous goods being transported shall meet regulatory requirements for TDG documentation and labelling.

All persons (e.g., shippers/drivers) handling dangerous goods for transportation shall hold valid TDG certification and carry proof of certification at all times while performing work.

Ensure all materials are stored in designated areas, and ensure layout and access is convenient for unloading and loading trucks and that there is sufficient clearance for safe movement of all necessary vehicles.

Storage requirements include:

- metal containers with lids shall be kept at convenient locations, to facilitate effective waste disposal
- overhead clearance shall be posted wherever necessary
- overhead power lines shall be clearly identified
- lumber shall be stored free of protruding nails and other associated hazards
- except for large tanks, material shall not be stored on the ground; for all other materials, store them on racks, skids, planks, or other safe and appropriate material
- stored material shall be stacked securely, to ensure prevention of tipping, sliding, collapse or other hazards
- pipe shall be adequately blocked/chocked when stored
- shelving shall:
    - be marked with weight limits
    - be secured
    - have determined inspection timeline requirements
- all secured loads shall be assessed prior to the release of the securing mechanism
- carefully assess the load to ensure the load has not shifted during transport

4.35 **Rail Locations**

Workers shall:

- never get on, under, or between moving or unsecured railway equipment
- not leave or place tools, vehicles or equipment on rail tracks
- look both ways before crossing a track; listen and look for trains or other railway equipment coming from either direction, at any time
- never stop a vehicle on or near tracks at a railway crossing or other locations along the tracks always adhere to Blue Flag signals and requirements
- ensure effective engine, stock and rail locking devices are used when required

If the operator of a locomotive is unable to safely and effectively operate a railroad's locomotive while operating near or on an Enbridge Facility, they shall cease operations. In such cases, the Enbridge Site Supervisor for the Enbridge Facility shall contact the rail line owner.

Enbridge Facilities that include rail lines on site, or nearby, shall ensure that safety measures and Hazard Assessments address the presence of rail lines and how the rail lines may affect the scope of work and range of possible hazards at that Facility.

4.36 **High-Pressure Water Jetting**

All water based cleaning operations conducted at pressures 5,000 psi or more or which develop more than 22 ft. lbs. of force shall be considered High Pressure Water Jetting (HPWJ). Simple pressure washing shall be defined as water-based cleaning operating at less than <5,000 psi and producing no more than 22 ft. lbs. of force.

When working with HPWJ, the following should be taken into consideration:

- advise Workers of any chemical hazards related to their activities

- plan work activities to avoid multiple types of maintenance activities in one area at a time; consider the likely or known sequence and steps of high pressure washing activities, and plan the work accordingly
- when cleaning piping systems, provide open access at least every 30 m (100 ft.), and remove flanged elbows or spool sections of pipe
- where possible, remove vessel components and clean them at a designated wash pad location, away from other personnel
- equipment specifications shall be available for review; Workers shall review the equipment specifications before set-up and use

The system shall be depressurized when:

- not in use
- unauthorized or inadequately protected Workers enter the work area
- replacement or repairs are made to the equipment, including tightening or loosening fittings
- recommended practices are violated

A HPWJ crew shall be composed of at least two Qualified operators and each crew member shall be in view of another crewmember at all times. The crew members should rotate their duties during the job to minimize fatigue to the operator holding the tools.

The equipment operator nearest the high-pressure nozzle shall always have a means of immediately reducing pressure or interrupting the flow to the nozzle.

At least one control valve or switch shall control each high-pressure tool.

An operator shall operate only one high-pressure lance, mole or shotgun at one time.

Sharp bends and turns can result in hose failure. High-pressure cleaning hose shall be positioned and handled to minimize bends and turns. High-pressure hose connections shall have whip checks and connections properly secured. When the hose is pressurized, personnel shall not handle the hose within one foot of the hose-to-hose connections.

High pressure water traveling at a high velocity can slice any solid material and has the tendency to inject microorganism in the human body. Some of the debris propelled by water-jets can injure eyes, skin, and body parts upon impact. There is also a risk of developing musculoskeletal or repetitive strain injuries when working with HPWJ equipment and tools.

Precautions to be used when performing HPWJ tasks include, but are not limited to:

- never point a pressure washer at yourself or others
- never attempt to push or move objects with spray from the washer
- always plug a properly grounded pressure washer into a properly grounded receptacle
- wear rubber-soled protective footwear that provide some insulation when using the pressure washer
- equipment in close proximity to the area where water blasting is being performed shall be adequately shielded or protected from debris and the water jet or spray
- use signage and flagging when required

5.0 Hazard Assessment, Elimination and Control Standard

5.1 Hazard Assessment

Regional, Department, Project and Contractor Management is responsible for ensuring:

- Workers are trained to assess potential and existing hazards specific to their work activities including hazard identification, assessment and control
- Hazard Assessments of work activities and Worksites are completed as required
- where reasonably practical, everyone involved in a work activity participates in the respective Hazard Assessment for that work
- Hazard Assessments are communicated to all Workers involved in the work activity in every case and common safety hazards inherent to the Facility are assessed and controlled
- the effectiveness of the Hazard Assessment program and Hazard Assessment training for Workers is sufficient
- opportunities for improvement are identified and implemented, as part of continuous improvement of the Hazard Assessment process
- Hazard Assessments are documented and retained

People Leaders are responsible for:

- verifying that the Hazard Assessment process is used in the workplace and is in compliance with this Standard
- ensuring appropriate use of the Hazard Assessment tools
- ensuring, through periodic review, that all workers are adequately trained in the Hazard Assessment process and tools given the scope of the work
- assessing work-in-progress to ensure that the tools are adequate to identify the hazards, and the controls implemented have reduced the risk associated with the work to As Low As Reasonably Achievable (ALARA) levels
- identifying opportunities for improvement of the process and communicating them to Management

Workers are responsible for:

- understanding the Hazard Assessment process and specific responsibilities as they apply to each worker
- actively participating in the Hazard Assessment process and ensuring that an appropriate level of assessment is completed before the start of all work
- ensuring that all workers involved in the work participate in the Hazard Assessment process
- communicating the results to all workers in the area who are affected by the work

Hazard Assessments shall be documented for all work activities other than office related work (e.g. computer use, training, meetings), travel between work locations and light housekeeping. These exceptions do not take away a worker's responsibility to assess hazards. Workers shall continue to practice cognitive

Hazard Assessment techniques (e.g. stop, look, assess, and manage). The appropriate Vice President shall approve any exemptions or variances.

Hazard Assessments shall include all workers involved with the work. The results of the assessment shall be communicated to all other workers who may be affected by the work. A toolbox meeting prior to the start of work will communicate the findings of the Hazard Assessment and ensure all workers involved in the work are adequately informed of the hazards, and they understand the controls developed to minimize the potential for harm.

Tools for Identifying, Assessing and Controlling Hazards

Enbridge utilizes distinct tools to identify, assess and control hazards associated with the design, construction, operation and maintenance of the pipeline system as follows:

Process Hazard Analysis

A Process Hazard Analysis (PHA) is a type of risk assessment with the following main goals:

- Identification of risks associated with a facility design, operation, system or installation
- Evaluation and minimization of the level of risks through mitigation and controls
- Understanding of the residual risk level of facility design, operation, system or installation with the goal of managing it effectively (training and/or procedure development)

Various industry-recognized PHA Review methodologies may be used in determining the risk associated with a given system or operation according to the scope and objectives of the study. The methodologies acceptable to Enbridge for conducting a PHA Review include What-If's, Hazard and Operability Studies (HAZOPS) and Layers of Protection Analysis (LOPAs).

Facility Hazard Assessments

All facilities and stations owned and/or operated by Enbridge are assessed for hazards inherent to the facility and its operations under normal operating conditions. The assessment includes taking into account:

- the nature of the hazard,
- the level of exposure to the hazard,
- the consequences of exposure, and
- the controls in place to address the hazard

This shall be documented on the Facility Hazard Assessment. Post the hazard list at the facility in conjunction with the Site Safety Plot Plans.

This list is reviewed by the operating group at each facility every 2 years or as required based on facility /process changes, upgrades or additions and are updated as necessary to ensure they remain current.

Use the Facility Hazard Assessment to assist with orientations and training, completing Hazard Assessments, or communicating site hazards.

Work-Planning Templates

Enbridge uses work planning templates to identify and plan complex multi-faceted projects and other non-routine work where exposure to open systems, high voltage electrical work or other high potential hazards exist. Safe Work Permits and FLHAs are still required with the use of Work-Planning Templates.

These templates require pre-planning of work to ensure itemization of specific work steps, identification of the hazards associated with each work step and placement of controls to either eliminate or control hazards to ALARA. The tools are effective at identifying engineering and administrative controls, which can be developed as a part of the planning phase thereby reducing the reliance on personal protective equipment (PPE) as the primary means of control at a worksite.

Task Safety Analysis

A Task Safety Analysis (TSA) is a systematic review of a task. Critical tasks are Liquids Pipelines Operations tasks that have been identified as critical through the task evaluation process. The results are tabulated in a “Task Evaluation List”.

Task Safety Analyses shall be completed, documented, and reviewed for critical tasks.

Procedures may be developed from the results of the Task Safety Analysis.

Completed task safety analyses or the developed procedures shall be communicated to all Workers who are, or will be, performing the associated task. Workers shall review TSAs or the associated procedures for the tasks they perform as conditions change.

Any errors or missing information in a TSA or procedure shall be communicated to the Workers People Leader for review and update as required.

Field Level Hazard Assessment

The Field Level Hazard Assessment (FLHA) is a card completed by Workers just prior to the start of work to identify and control the field-based hazards of the work being performed, and site or environmental conditions that may adversely affect the work (e.g. icy conditions, simultaneous operations, pedestrians).

This form is required for all work activities except for the following:

- office related work (e.g. attending meetings, working at a desk, phone conferences)
- travel between locations (e.g. travel to Worksites, walking or driving between buildings)
- light housekeeping

When an FLHA is required, it shall be completed prior to work commencing. The existing FLHA may be reviewed and updated as work changes throughout the shift providing the scope of work does not change.

All work that requires a SWP requires an FLHA for the scope of work covered by the SWP. If scope of work changes to any permit required work, a new FLHA shall be completed.

An FLHA may cover individual or group work provided the group is performing the same task. All Workers performing the work shall participate in the FLHA

completion. Any additional Workers joining the work activity shall review, attempt to identify additional hazards and controls, and sign off on the active FLHA.

5.2 Pre-Job Meetings/Tailgates

The following types of work shall have a specific pre-job meeting with Workers involved in the task to discuss the specific hazards associated with the job:

- High Voltage Electrical work
- Serious and Critical lifts
- Confined Space Entry
- Ground Disturbance
- Work around overhead power lines
- Open systems work
- Pigging
- Tie-ins
- Specific one-off jobs that are hazardous

On a daily basis the Contractor will conduct a “tailgate” safety meeting to review the daily work permit and health and safety issues associated with the day’s work, or in some cases, prior to a specific high-risk task.

On a weekly basis, or one per work rotation, the Contractor will conduct a formal safety meeting to review all health and safety issues and forward a copy of the written minutes to the Enbridge Site Inspector for review.

5.3 Hazardous and Restricted Areas

A Safe Work Permit and Atmospheric Monitoring is required prior to Contractors entering Hazardous Area or Restricted Areas.

A Hazardous Area is where there is significant potential for a flammable or toxic atmosphere to be present or develop.

Workers shall observe Safe Work Permit requirements for work in hazardous areas and near hazardous areas, including:

- investigating facilities for known or suspected anomalies
- repairing facilities with leaks, defects or corrosion pits/clusters where the calculated rupture pressure ratio is less than one
- welding directly on mainline or station piping
- welding on a pressurized split tee with longitudinal fillet-welded check straps/backing straps
- welding on a pressurized Morrison sleeve

For information regarding Hazardous Areas in relation to specified facilities at typical stations and mainline locations, see Figures 1–10.

A Restricted Area is where there is limited potential for a flammable or toxic atmosphere to develop. Workers shall observe Safe Work Permit requirements for work in restricted areas.

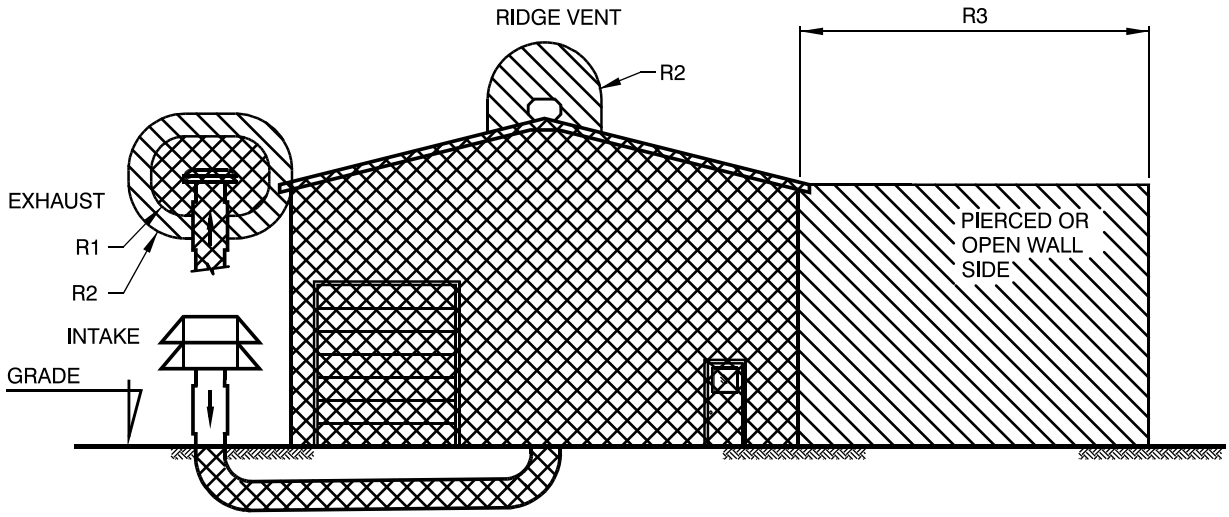
For information regarding the proximity of Restricted Areas in relation to specified facilities at typical stations and mainline locations, see Figures 1–10.

Hazardous Areas and Restricted Areas should be reflected on site safety plot plans (posted at all station sites).

Do not use site safety plot plans for use in determining electrical equipment installation requirements. Use the area classification requirements in the Engineering Design Standards for this purpose.

When changes to facilities affect site safety plot plans, the site supervisor shall:

- note and describe the additions and/or deletions in a memo and on the existing site safety plot plan
- forward the information to the regional office to be reviewed and sent to Engineering Services; Engineering Services then issues a revised site safety plot plan



LEGEND

- HAZARDOUS AREA
- RESTRICTED AREA
- NONCLASSIFIED

	DISTANCE		
COMMODITY	R1	R2	R3
LIQUID PETROLEUM	0.9 m (3'-0")	1.5 m (5'-0")	15 m (50'-0")
NGL	1.5 m (5'-0")	4.5 m (15'-0")	30 m (100'-0")

NOTES: A wall that contains a door, window, air vent, etc., or has a pipe, conduit or cable passing through it is defined as a pierced wall. In practice, this means the distance R3 will usually surround a building.

Figure 1- Mainline Pump/Booster Pump Shelters/Rooms

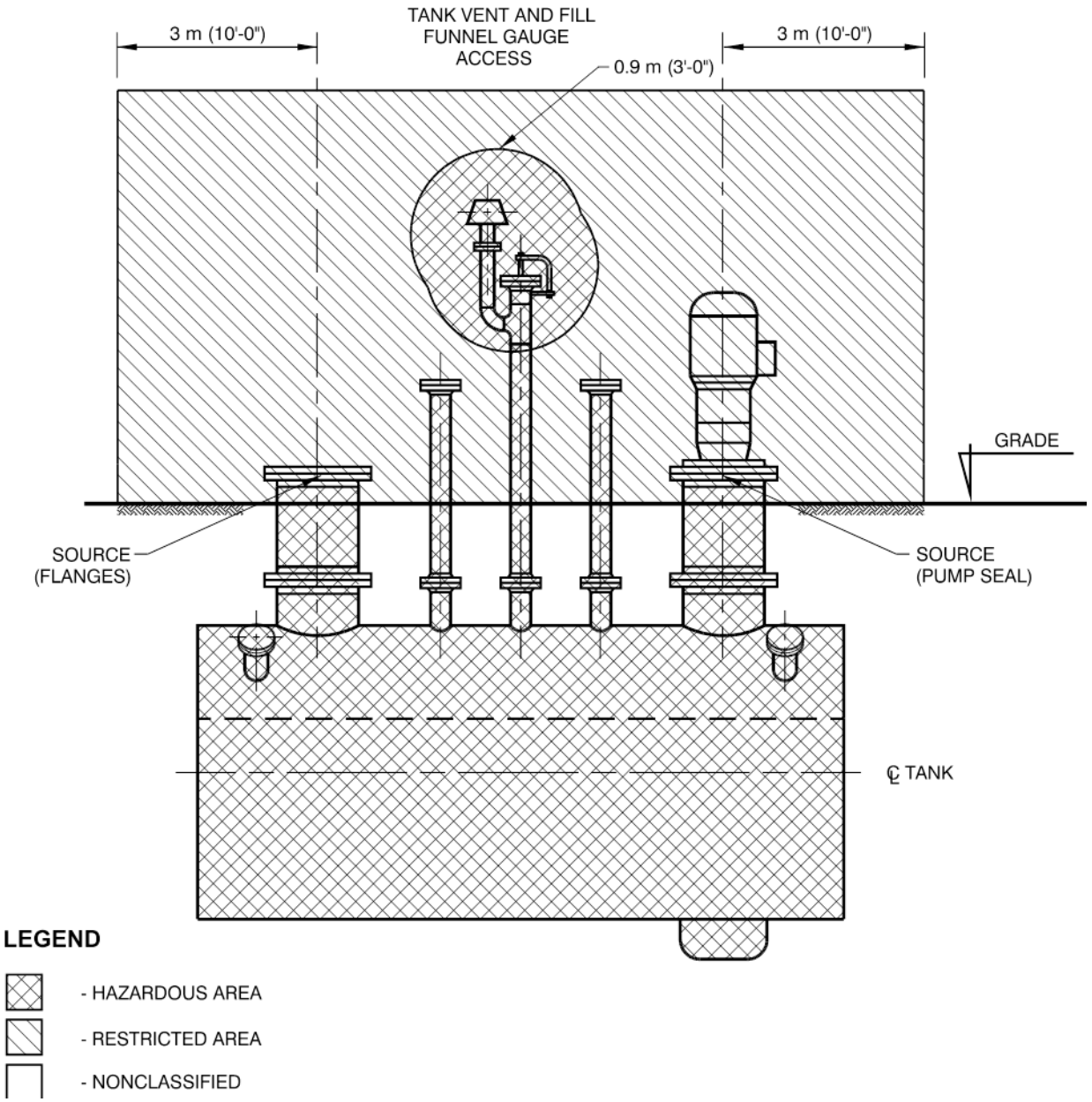
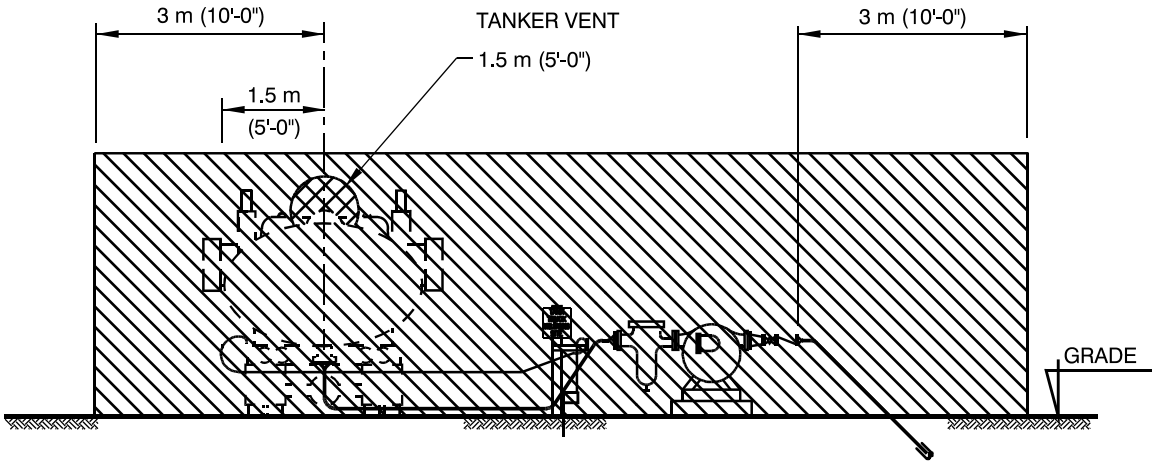


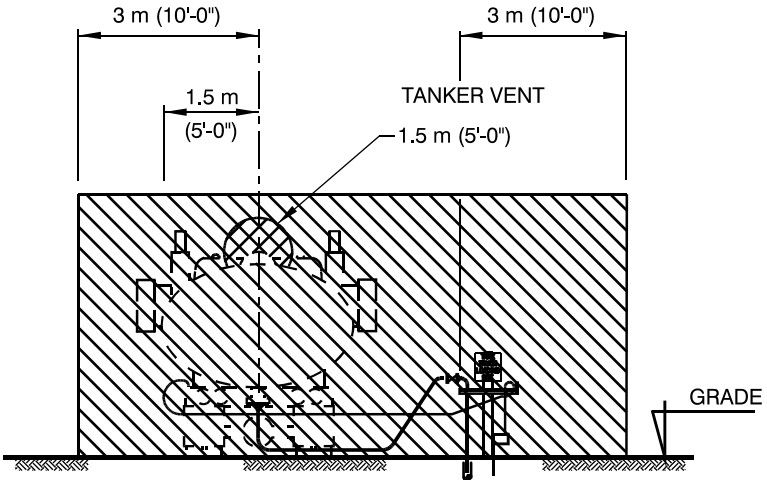
Figure 2- Sump Tank and Vents



LEGEND

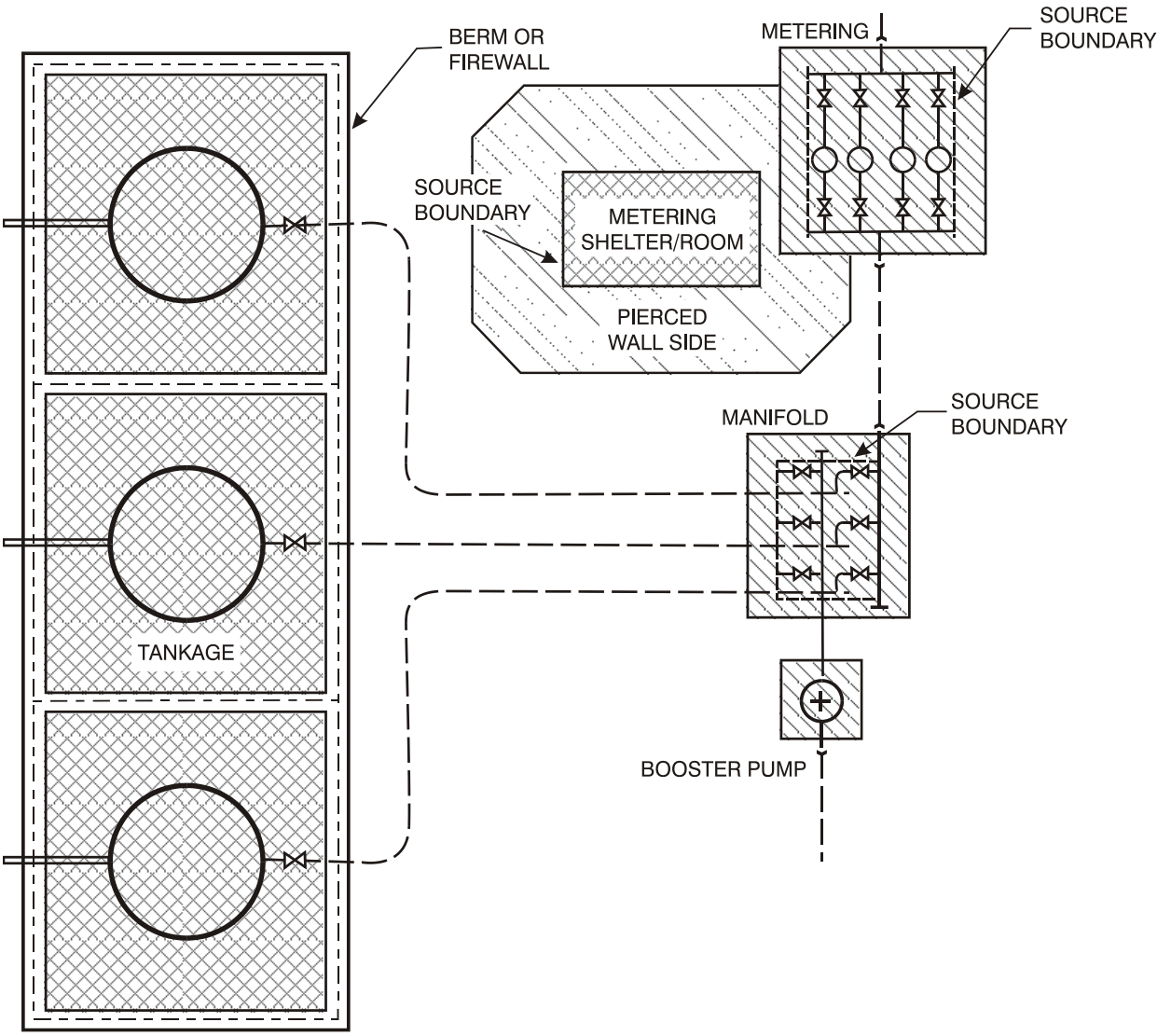
- HAZARDOUS AREA
- RESTRICTED AREA
- NONCLASSIFIED

TYPICAL TANK TRUCK UNLOADING FACILITY



TYPICAL TANK TRUCK LOADING STATION

Figure 3- Tank Truck Facilities



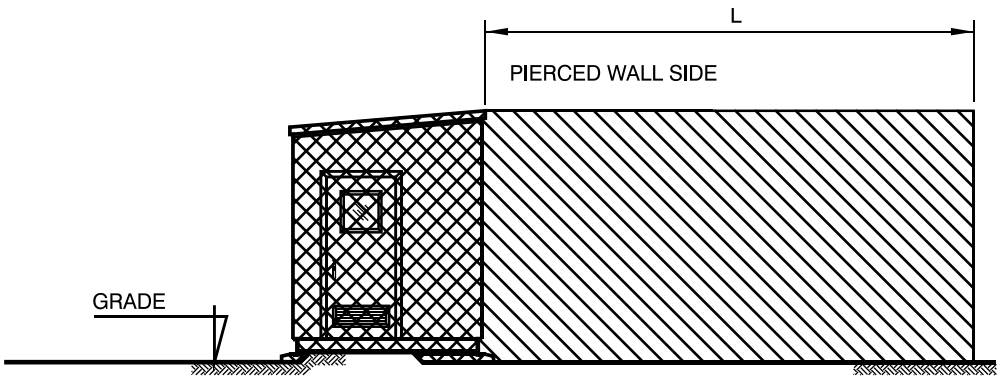
LEGEND

- HAZARDOUS AREA
- RESTRICTED AREA
- NON-CLASSIFIED

FACILITY	DISTANCE	
	LIQUID PETROLEUM	NGL
OUTDOOR MANIFOLD*	3 m (10'-0")	6 m (20'-0")
METERING SHELTER*	3 m (10'-0")	6 m (20'-0")
OUTDOOR METERING*	3 m (10'-0")	6 m (20'-0")
OUTDOOR BOOSTER PUMP**	15 m (50'-0")	30 m (100'-0")

*DISTANCE FROM SOURCE BOUNDARY
**DISTANCE FROM CENTER OF PUMP

Figure 4- Metering Shelters/Rooms and Areas, Manifold Areas, Booster Pumps and Tankage Areas



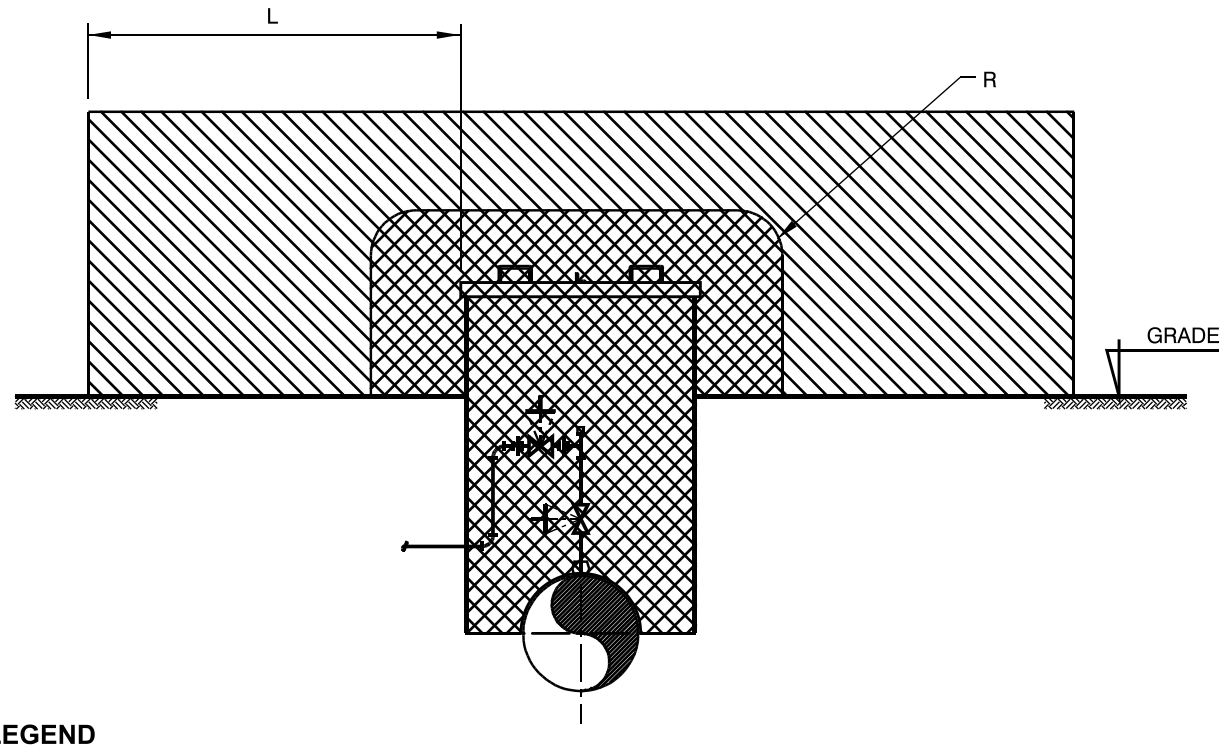
LEGEND

- HAZARDOUS AREA
- RESTRICTED AREA
- NONCLASSIFIED

COMMODITY	DISTANCE L
LIQUID PETROLEUM	3 m (10'-0")
NGL	6 m (20'-0")

NOTES- A wall that contains a door, window, air vent, etc., or has a pipe, conduit or cable passing through it is defined as a pierced wall. In practice, this means the distance R3 will usually surround a building.

Figure 5- Densitometer, Sampler and Instrument Shelters

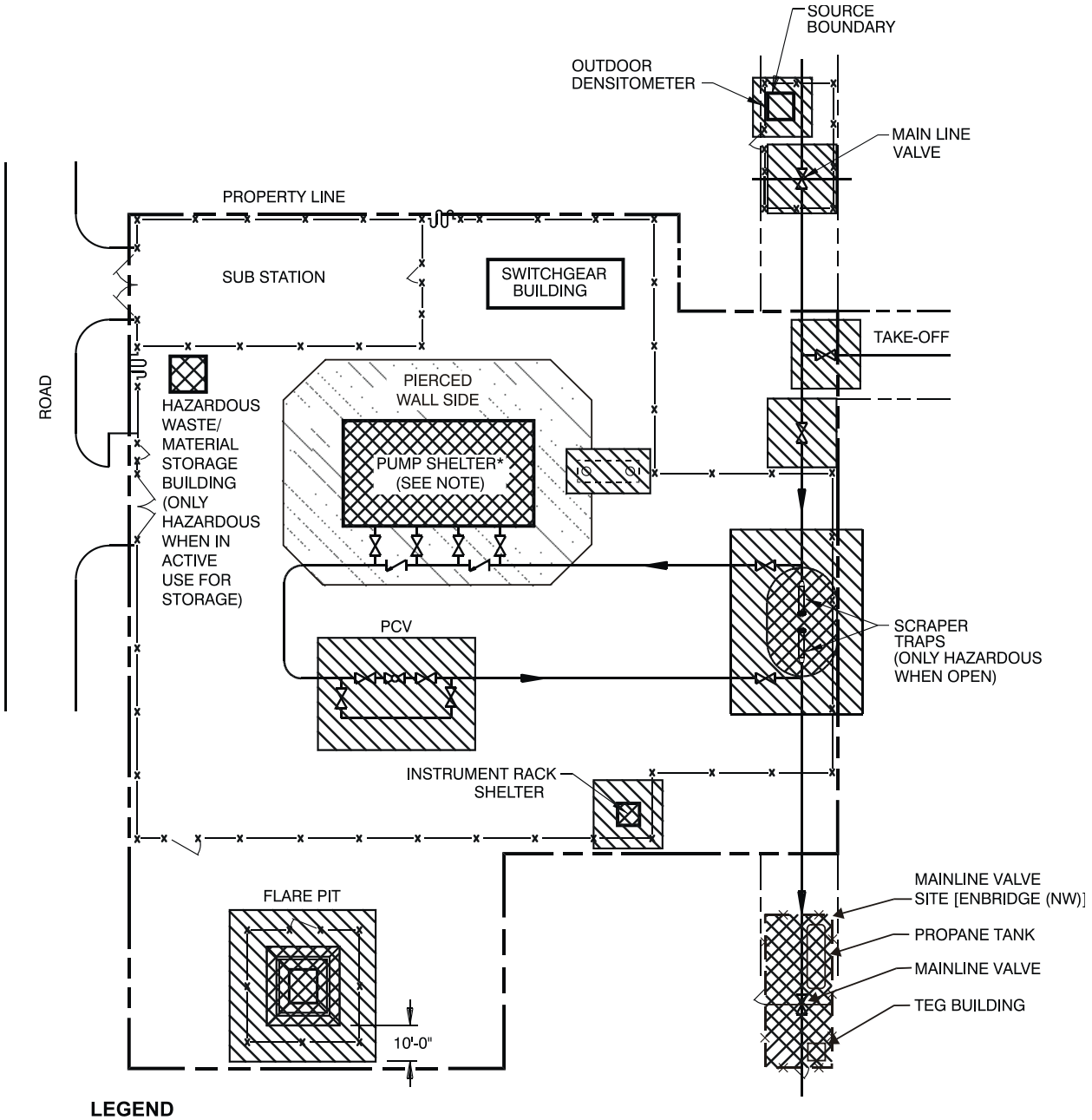


LEGEND

- HAZARDOUS AREA
- RESTRICTED AREA
- NONCLASSIFIED

COMMODITY	DISTANCE L	DISTANCE R
LIQUID PETROLEUM	3 m (10'-0")	1.5 m (5'-0")
NGL	6 m (20'-0")	1.5 m (5'-0")

Figure 6- Below-Grade Access Culverts



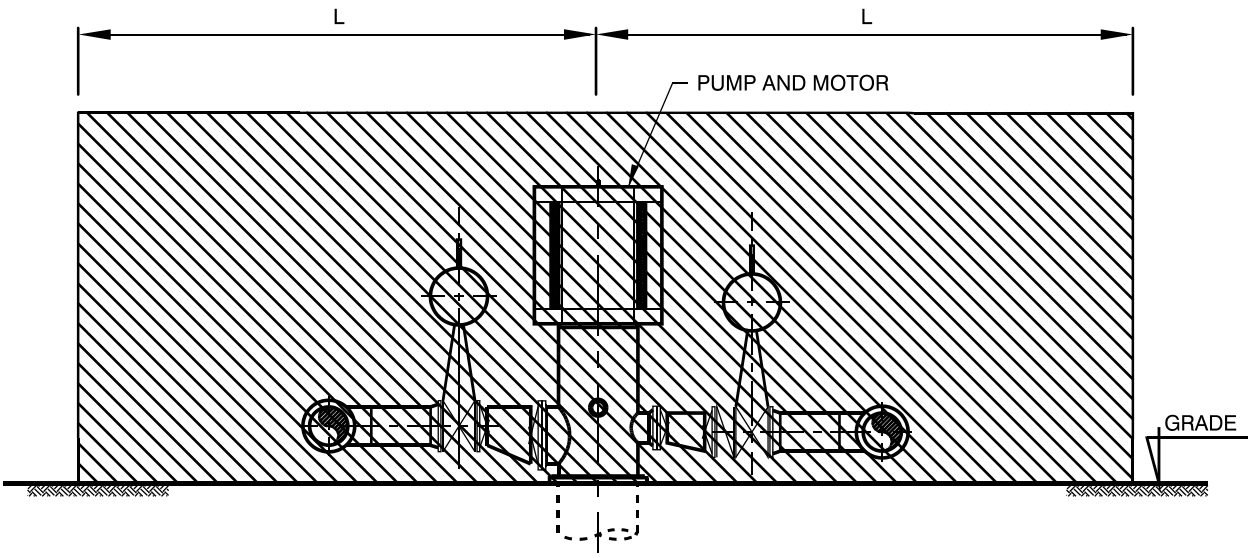
LEGEND

- HAZARDOUS AREA
- RESTRICTED AREA
- NONCLASSIFIED

FACILITY	DISTANCE	
	LIQUID PETROLEUM	NGL
OUTDOOR DENSITOMETER	3 m (10'-0")	6 m (20'-0")
VALVES	3 m (10'-0")	6 m (20'-0")

* NOTE: INCLUDES PUMP & ENGINE ROOMS IN ENBRIDGE (NW)

Figure 7- Typical Stations and Mainline Area Classification

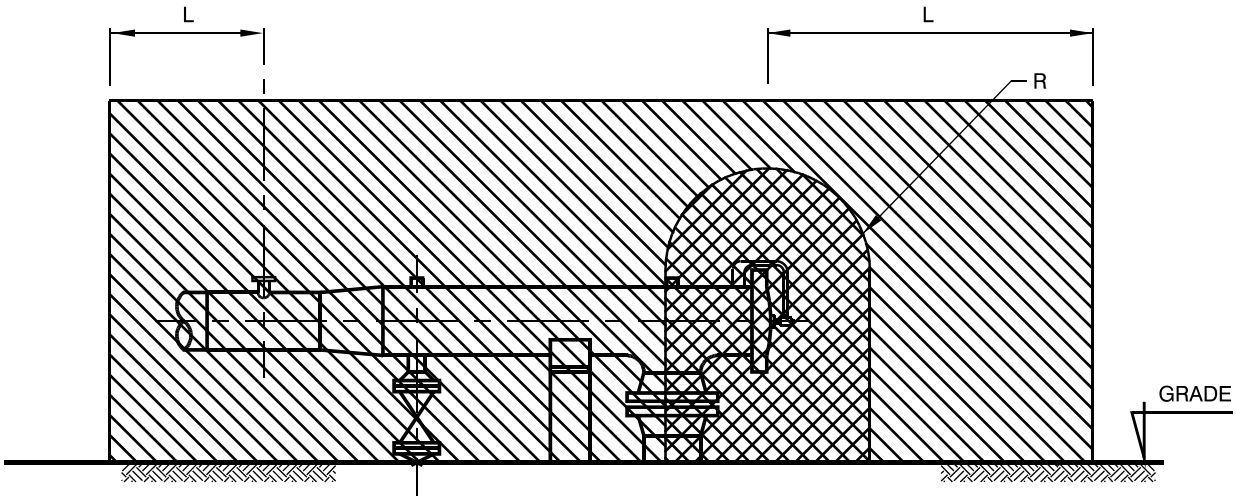


LEGEND

- HAZARDOUS AREA
- RESTRICTED AREA
- NONCLASSIFIED

COMMODITY	DISTANCE FROM CENTRE OF PUMP L
LIQUID PETROLEUM	15 m (50'-0")
NGL	30 m (100'-0")

Figure 8- Outdoor Pumps



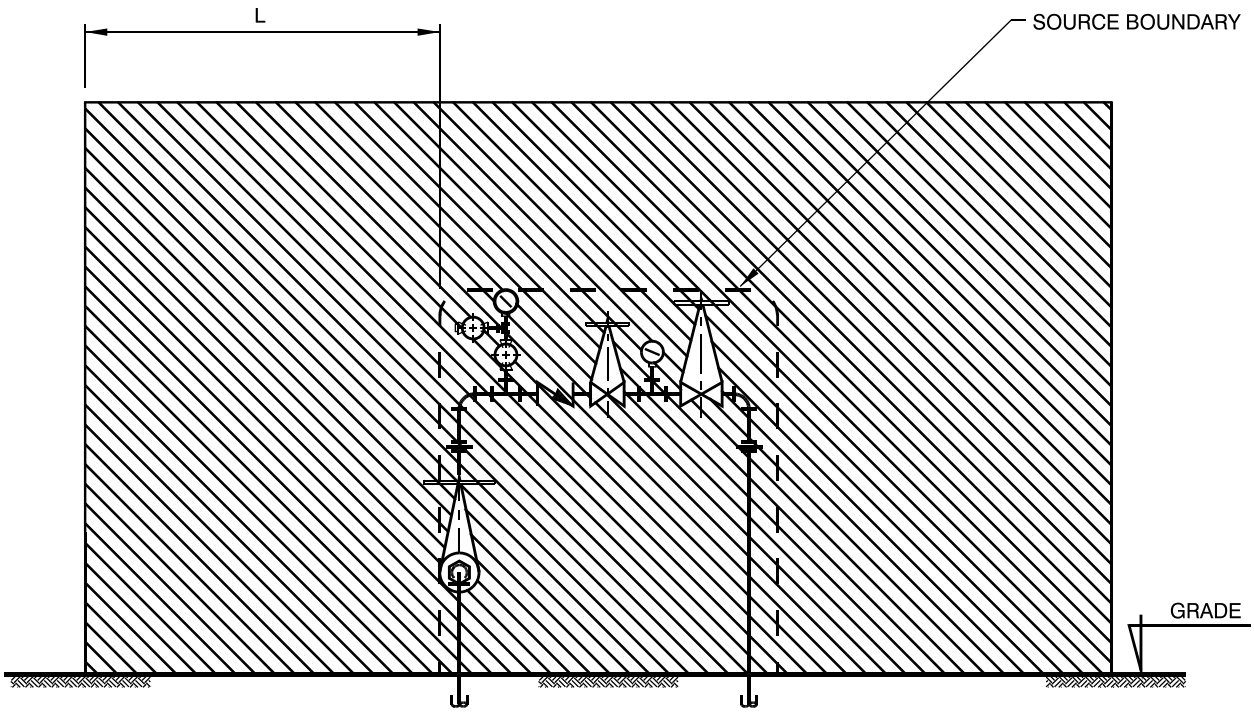
LEGEND

- HAZARDOUS AREA (ONLY WHEN OPEN)
- RESTRICTED AREA
- NONCLASSIFIED

COMMODITY	DISTANCE FROM TRAPS / PROVERS* L	R - (ONLY WHEN OPEN)
LIQUID PETROLEUM	3 m (10'-0")	1.5 m (5'-0")
NGL	6 m (20'-0")	1.5 m (5'-0")

*FOR PROVERS, L IS MEASURED FROM PERIMETER OF PROVER AND R IS FROM PROVER OPENINGS.

Figure 9- Provers and Scraper Traps



LEGEND

- HAZARDOUS AREA
- RESTRICTED AREA
- NONCLASSIFIED

COMMODITY	DISTANCE L
LIQUID PETROLEUM	3 m (10'-0")
NGL	6 m (20'-0")

Figure 10- Valves and Instrumentation

5.4 **Open System**

Open Systems include, but are not limited to, the following operations:

- Removing booster pumps, mainline pumps, pump crowns or pump elbows
- Removing meters or meter bonnets
- Removing strainers or strainer bonnets
- Removing valves or valve bonnets
- Removing storage tank seals, tank manways or tank mixers
- Opening scraper trap or prover doors
- Cutting pipe sections or separating flanges on piping larger than 2 in. diameter
- Opening/closing fittings used for venting during isolation and filling of pipe sections, pumps, scraper traps, provers, etc.
- Opening vacuum truck clean-outs
- Tank gauging

Workers in the immediate vicinity of open systems shall:

- Wear full face air purifying respirators with combination acid gas/organic vapor cartridges with a P100 filter or combination filter until H_2S, LEL, benzene and mercaptans (if applicable) levels can be verified through initial air testing
- When an alarm of a portable gas monitor is activated, stop their work, shut down any operating equipment adjacent to the area if it is safe to do so, and then leave the area immediately by proceeding upwind and re-evaluate the health and safety risks before returning to the work area

If a hazard assessment verifies that no atmospheric hazards exist then a lesser degree of RPE may be used when first opening the system. Hazard assessment verification may be provided by, but not limited to, the following:

- Engineering control mechanism
- Testing of a system by acceptable industry practices
- Industrial hygiene data

Open system work shall use a Job Planning Template when required.

5.5 **Site Planning**

A Site Traffic Plan shall:

- be implemented when working around highways and public busy roadways
- incorporate parking areas away from work activities
- incorporate traffic flow
- have Flagging and signage requirements that meet Applicable Legislation

Permanent facilities shall utilize the Facility Hazard Assessment to establish traffic planning requirements.

Winter Site Planning shall:

- incorporate safe winter access as a primary consideration; consider need to remove snow/maintain route, gradient risks (pitch and roll grades), type/number vehicles accessing site
- ensure all vehicle access is appropriately evaluated

- identifiable vehicle access through flagging and signage maintained to an appropriately safe condition
- ensure vehicle access is sanded as appropriate
- consider vehicle access to the Worksite and avoid having locations where equipment/vehicles could slip or lose control due to winter conditions and potentially converge with work space or walkways; where this concern exists the Contractor shall ensure mitigating measures are taken such as use of spoils/berm for a physical barrier, clearing Workers to a safe location when equipment is coming into location, or implementing other such safety measures as required

6.0 Safe Work Permit and Work Authorization Standard

Safe Work Permits (SWP) and Work Authorizations (WA) should not be regarded as a statement that all hazards and risks have been eliminated from the work area. The issuing of such a document does not, by itself, make a job safe. That can be achieved only by those preparing for the work and those carrying it out.

6.1 Responsibilities for Issuing Safe Work Permits and Work Authorization

Regional and Project Management is responsible for ensuring:

- Safe Work Permit (SWP) and Work Authorization (WA) issuers are Qualified to issue Safe Work Permits and Work Authorizations
- Safe Work Permit training is made available and completed by Workers who will be issuing Work Authorizations or Safe Work Permits
- Work Authorization and SWP audit process is implemented in the workplace
- opportunities for improvement are identified and implemented for continuous development of the Work Authorization and Safe Work Permit process
- Work Authorizations and Safe Work Permits are documented and retained as required
- spot checks are completed and documented on the "SWP/Hazard Assessment Review Checklist" for each of the following (as available):
    - a minimum of one Work Authorization Form; and
    - a minimum of one Safe Work Permit

People Leaders are responsible for:

- verifying, through audit or direct observation, that the Work Authorization and SWP process is used in the workplace and is in compliance with this Standard
- ensuring appropriate use of Work Authorization and Safe Work Permit
- ensuring, through periodic review, that SWP issuers are adequately trained in the Work Authorization and SWP process and tools given the scope of the work
- identifying opportunities for improvement of the process and communicating them to Management

The Work Authorization Issuer is responsible for:

- successfully completing the SWP training
- specifying the work to be carried out and the location of the work in cooperation with the Enbridge Inspector
- communicating any operational or Atmospheric Monitoring requirements as well as any site specific hazards to the Enbridge Inspector
- determining if the work being performed may impact operations
- verifying the Enbridge Inspector understands the conditions of the Work Authorization
- suspending and revalidating Work Authorization as required
- establishing the frequency of contact with the Enbridge Inspector
- authorizing the Enbridge Inspector to issue Safe Work Permits for the work indicated on the work authorization
- communicating to the respective region active Work Authorizations

The SWP Issuer shall be familiar with the worksite and the site specific hazards covered by the SWP being issued. The Permit Issuer is responsible for:

- completing SWP training
- specifying the work to be carried out and the location of the work in cooperation with the SWP receiver
- identifying and discussing site specific hazards with the SWP receiver
- determining if the work being performed may impact operations
- ensuring permit is correctly completed
- conducting or having a Enbridge Representative perform initial Atmospheric Monitoring (when required) and documenting the results on the SWP
- verifying the SWP receiver understands the conditions of the SWP
- suspending and revalidating work as required
- conducting periodic general inspections of the job site to confirm adherence to SWP
- inform SWP receiver of changes that could impact their work (including if the SWP issuer is transferring their responsibility to another Issuer)

A Worksite visit with the SWP Receiver to identify hazards of the work location may be required based on job scope.

The SWP Receiver shall be familiar with the SWP process, the work area, equipment, and understand the work to be carried out. The SWP receiver is responsible for:

- reviewing and agreeing to the conditions of the SWP
- communicating the SWP requirements to all Workers involved in the work
- ensuring the SWP requirements are fulfilled by all workers during the work
- keeping a copy of the SWP readily available at the work location
- suspending work as required
- having suspended work revalidated by SWP issuer before recommencing work
- ensuring FLHAs are completed and reviewed for the work and that workers involved in the work participated in the FLHA
- informing SWP issuer of a transfer of responsibility to determine if a new SWP is required
- returning the equipment, process or area to a safe condition before returning the safe work permit and field level Hazard Assessments back to the SWP issuer
- ensuring SWP permits are completed and signed-off when returned to the SWP issuer

The Enbridge Inspectors responsibilities include those expected of the SWP issuer as well as being responsible for:

- reviewing scope of work and location of work with Work Authorization Issuer
- identifying to the Work Authorization Issuer the other Enbridge Inspectors who will be issuing SWPs on a job
- ensuring other Enbridge Inspectors authorized to issue SWPs on a job are aware of and agree to the Work Authorization details
- ensuring the Work Authorization agreement is adhered to for the duration of the job

- issuing SWPs to the working group(s)

6.2 Safe Work Permit Requirements

Work requiring SWP

- work where the shutdown and/or isolation of equipment and/or processes are required to complete the work
- work on electrical equipment and circuits with voltages >750V (CAN) or 600V (USA)
- work upstream of the 480V main breaker
- Hot Work in hazardous or restricted areas with the following exceptions
    - driving vehicles through restricted areas
    - breaking low voltage connections in restricted areas
    - work that involves using low voltage equipment such as voltmeters, laser alignment and hand-held vibration meters, analyzers or cellular telephones (continually monitor the work area for combustible vapors in this case)
- work on or around an open system with the following exceptions
    - flushing units
    - gauging
    - sampling
    - opening depressurized lines less than or equal to 2 inches in diameter
- looking for and work on pipeline anomalies
- work on leaks or leak sites
- welding on mainline or station piping
- work involving Contractors with the following exemptions:
    - Driving vehicles through non-hazardous or non-restricted areas
    - Delivery/service personnel (e.g. delivery and supply vendors, equipment service personnel, telephone, computer, etc.)
    - Long Term Operations Contractor Personnel

Contractor exemptions shall be approved by the person responsible for the location, and work shall be monitored by an Enbridge Operations employee or designate.

A SWP is not required for work taking place solely in a Confined Space however, if the Confined Space work is part of a broader scope of work (e.g. tank cleaning operation), the Confined Space work shall be covered on a SWP. Confined Space permit requirements as set out in section 8.3 of this manual shall also be met for all Confined Space work.

Exemptions for Long Term Operations Contractor Personnel

Long term Operations Contractor Personnel may be given an exemption for a Safe Work Permit for up to one year if all the following requirements are met:

- approved by the Operations employee responsible for the Contractor and Operations management or the person responsible for the work location(s)
- they have been used on a frequent basis or have worked extended periods of time with Enbridge
- clearly demonstrate their knowledge and understanding of safe work practices and technical procedures applicable to their line of work
- given a thorough safety orientation

- they participate in Enbridge safety meetings as determined by the person responsible for the site
- they maintain daily communication with Enbridge Operations Representative or designate
- they are monitored by the Enbridge Operations Representative or designate responsible for the location and work

The Enbridge Operations Representative responsible for a Contractor shall document an exemption and provide copies to the Contractor, Operations management, and employee(s) responsible for the location(s).

Documentation shall include:

- a brief description of the services being provided (e.g., welding, electrical, mechanical labor, inspection services, cathodic protection system maintenance)
- justification for the exemption
- names of Contractor and Subcontractor Personnel
- special requirements;
- locations for which the exemption applies (e.g., station, ROW milepost boundaries);
- period of time for which the exemption applies; and
- names of Enbridge employees who approved the exemption

Long term Operations Contractor Personnel provided an exemption shall comply with the requirements for a SWP.

General Requirements

- Enbridge Inspectors issuing SWPs shall receive a valid Work Authorization prior to issuing any SWPs
- Only the work stipulated on the SWP in the identified location is to be performed
- All workers shall be made aware of and adhere to the conditions of the SWP
- The working group shall complete a FLHA prior to commencing work
- SWP issuers cannot issue permits to themselves
- SWP may be issued verbally, electronically, or in person
- When required, initial Atmospheric Monitoring shall be conducted and documented on the SWP before work can begin
- Subsequent Atmospheric Monitoring is completed as indicated on the SWP

Initial Atmospheric Monitoring is an Enbridge responsibility and shall be completed or witnessed by an Operations Representative, Enbridge Inspector or another Enbridge representative. This initial testing shall be documented on the SWP. Subsequent Atmospheric Monitoring can be performed by the person responsible for the work and may be verified by Enbridge.

Duration

- A SWP is only valid for the time stated on the permit to a maximum of 12 hours (exception mobile crews without Enbridge Inspector).
- A SWP may be extended an additional 12 hours provided that:
    - The Workers do not exceed the maximum allowable hours worked
    - A review of the SWP indicates it is still valid
    - All Workers understand the requirements of the SWP and meet FLHA requirements

- An extension is identified and authorized on the SWP as required
- Transfer of responsibility is completed as required (note: a SWP can only be transferred once)

Mobile Crews without Enbridge Inspector

- Mobile Crews are Contractor crews required to perform a specific job function over a specified span of ROW or at multiple Facilities without direct oversight by an Enbridge Representative (e.g. pig trackers, cathodic protection, surveyors, vegetation control)
- Mobile crews may be issued a SWP at the originating location of the work for the duration of the job provided that:
- a frequency of contact is established and implemented (this frequency of contact is the minimum requirement of how often the SWP receiver shall contact the Issuer of the SWP. The SWP receiver documents this communication under the "Frequency of Contact with Issuer or Designate" section on the SWP; additional documentation may be attached to the SWP should space not be available)
- a new FLHA is completed at the beginning of each day or shift and updated as required

Transfer of Responsibility

Any changes to the responsible parties during the course of the work shall be documented on the SWP as a transfer of responsibility. The SWP issuer, receiver and all workers affected shall be made aware of any transfers of responsibilities. The SWP issuer reserves the right to suspend the current SWP and require a new SWP to be issued.

Document Copies

- White/top copy: SWP receiver keeps or posts this copy at the work location while the permit is valid SWP receiver returns this copy, FLHA and other pertinent documentation to the SWP issuer when the SWP time period has expired

If an incident occurs during the course of work, the white copy of the SWP along with all other documentation shall be forwarded to the person responsible for conducting the incident investigation and will be retained as identified in the requirements for incident investigation documentation

- Yellow copy: SWP issuer posts this copy at the worksite or similar site locality to identify work activities occurring at the site. Discard after the white copy is returned or give to the SWP receiver if requested.

In compliance with Enbridge's Records Management Policy and Records Retention Schedule, Enbridge Employees must retain all Safe Work Permits and any related documents or records. Contractors shall have a records retention policy to ensure that all documents or records used, prepared or produced by the Contractor in the performance of the work are maintained by the Contractor for durations of time that are not less than the limitation periods prescribed in the applicable statutes of limitations or limitation of actions legislation in force in the jurisdictions the Contractor operates.

6.3 Work Authorization Requirements

General Requirements

- Required for all Enbridge Inspectors issuing SWPs
- Receiving a Work Authorization authorizes an Enbridge Inspector to issue Safe Work Permit(s) to the working group(s) for the scope of in the location identified on the Work Authorization
- If the job has multiple Enbridge Inspectors the names of the Enbridge Inspectors authorized to issue SWPs shall be written on the Work Authorization Form

The requirement for a Work Authorization is a regional determination by Operations Management for new construction on Greenfield Worksites.

Duration

Work Authorizations may be issued to cover multiple shifts or days if the job conditions and scope of work remain the same.

In this case, the general practice is:

1. A single Work Authorization Form is issued to the Enbridge Inspector for the duration of the job.

The Work Authorization issuer and receiver shall agree upon a reasonable frequency of contact. This frequency of contact is the minimum requirement of how often the receiver of the Work Authorization shall contact the issuer of the Work Authorization. The receiver of the Work Authorization documents this communication under the “Frequency of Contact with Issuer or Designate” section on the SWP. Additional documentation may be attached to the form should space not be available.

2. The Enbridge Inspector issues a Safe Work Permit per shift or day per the requirements.

Document Copies

- White/top copy: Enbridge Inspector keeps or posts this copy at the work location while the work authorization is valid. Inspector returns this copy to the issuer when the Work Authorization is no longer valid.
  If an incident occurs during the course of work, the white copy of the Work Authorization along with all other pertinent documentation shall be forwarded to the person responsible for the investigation and will be retained as identified in the requirements for incident investigation documentation.
- Yellow copy: Work Authorization issuer posts this copy at the worksite or similar site locality to identify work activities occurring at the site. Discard after the white copy is returned or give it to the Inspector if requested.

6.4 Suspension of Work Authorization and Safe Work Permits

The Work Authorization and/or Safe Work Permit become suspended and work shall stop under any of the following conditions:

- site emergencies
- scope of work changes

- requested to stop work

The time of suspension shall be documented on the Work Authorization or SWP, as the case may be, by the receiver. Suspended permits shall be revalidated, at a minimum, verbally by the issuer and documented on the Work Authorization or SWP before work can resume.

Suspensions due to scope of work changes cannot be revalidated. A new Work Authorization and/or SWP is required.

7.0 Personal Protective Equipment Standard

7.1 Personal Protective Equipment

Enbridge employees are provided, at no cost, all required basic PPE.

Enbridge management (including Regional, Departmental & Project) and Contractor management are responsible for:

- training employees on the proper use, care, maintenance and limitations of PPE
- determining when PPE is required, based on Hazard Assessments
- ensuring that each type of PPE used by an employees is fitted properly
- retraining employees when workplace changes and/or revised PPE make previous training obsolete
- ensuring Workers use only approved PPE

All Workers are responsible for using approved PPE and for maintaining PPE in accordance with manufacturers' specifications. Materials or supplies used for cleaning PPE shall be provided at no cost to Workers.

The minimum PPE for all Enbridge Worksites in the field shall be:

- safety glasses (prescription or not), with fitted side-shields and protective lenses
- safety boots with minimum 6-inch ankle support, i.e., minimum 15 cm (6 in.) to the top of the boot from the heel
- full-length pants and long sleeved shirts
- approved hard hat
- gloves that provide sufficient protection for the work being performed
- additional PPE or protective apparel may be required, depending on the specific site requirements, hazards or activities

At the discretion of the Site Supervisor, short sleeve t-shirts may be worn for job tasks that have been determined by the Hazard Assessment to be low risk.

On Mainline Construction Worksites, Workers shall wear shirts with sleeves at least 15 cm (6 in.) long, unless the Hazard Assessment identifies that long-sleeved shirts are required.

There may be times where it is necessary to remove PPE to mitigate a hazard (e.g., Rotating equipment, congested spaces etc.). In these cases PPE may be removed as long as it is noted on the hazard assessment and any additional hazards created by the removal of the PPE are identified and controlled.

The following table provides guidance for PPE selection for certain work activities. When using the table, also review work practices, procedures, product SDS. In addition, conduct a Hazard Assessment to ensure all potential and existing hazards are identified and determine if additional PPE or higher levels of PPE are required. Workers conducting a work activity which requires Atmospheric Monitoring shall use the monitoring results to verify adequacy and appropriateness of Respiratory Protective Equipment (RPE) to be used for the work.

Table 1 – PPE Selection Guidelines for Work Activities

	PPE (In addition to the minimum PPE required for all Enbridge Locations)			
Work Activity	**Eye, Face & Hearing**	**Hand**	**Body**	**Respiratory Protective Equipment** (These are the minimum requirements; a higher level of RPE may be required based on Atmospheric Monitoring)
Spill Response	Chemical splash goggles and/or full-face shield may be required when handling product or contaminated material.	Chemically impervious gloves if handling product.	FR Garments Chemically impervious suit, preferably made from approved FR material as identified by SDS or by assessments of potential and existing hazards Chemically impervious boots.	First Responder: half-mask APR with Organic Vapor/Acid Gas cartridge. For ongoing work refer to 7.9 Respiratory Protective Equipment, Table 1- Respiratory Protection for Exposure Concentrations and Site Safety Plot Plan.
Confined Space Entry	As per assessment of all potential and existing hazards.			See Confined Space Entry Standard.
Tank Cleaning	Chemical splash goggles and/or full-face shield may be required when handling product.	Chemically impervious gloves if handling product.	FR Garments Chemically impervious suit, preferably made from approved FR material as identified by SDS or by assessments of potential and existing hazards Chemically impervious boots.	See Confined Space Entry Standard.
Nitrogen Purge	Chemical splash goggles and/or full-face shield when exposed to liquid spray. Hearing protection.	Chemically impervious insulated gloves.	FR Garments Neoprene or nitrile apron.	SCBA or SAR (with escape bottle) is required for an oxygen deficient atmosphere and/or if work is in a Confined Space or a poorly ventilated area. If the oxygen concentration is within acceptable levels, follow RPE requirements for Open System work.
Handling PCBs	Chemical splash goggles or full-face shield.	Chemically impervious gloves for longer than 1 hour of use or change nitrile gloves every 1 hour of use.	FR Garments Neoprene or nitrile apron, disposable coveralls. Chemically impervious boots.	None for normal use. Higher level of RPE may be required based on Atmospheric Monitoring; or if there is potential for the release of PCBs in a vapor or mist form.

	PPE (In addition to the minimum PPE required for all Enbridge Locations)			
Work Activity	**Eye, Face & Hearing**	**Hand**	**Body**	**Respiratory Protective Equipment** (These are the minimum requirements; a higher level of RPE may be required based on Atmospheric Monitoring)
Handling Toluene or other Solvents	Chemical splash goggles. Full-face shield and when handling large quantities, exposed to liquid spray or transferring liquids.	Chemically impervious gloves for longer than 1 hour of use or change nitrile gloves every 1 hour of use.	FR Garments Neoprene or nitrile apron.	Review SDS for RPE requirements. Handle in a fume hood when possible.
Handling Acids or Caustics (including acid batteries)	Chemical splash goggles. Full-face shield when handling large quantities, exposed to liquid spray or transferring liquids	Chemically impervious gloves.	Neoprene or nitrile apron as required by SDS.	Handle in a fume hood when possible. If not possible wear a half-mask APR with Organic Vapor/Acid Gas cartridge with P100 filter.
Handling Natural Gas Liquids	Chemical splash goggles. Full-face shield when exposed to liquid spray or transferring liquids. Hearing protection as per Hazard Assessment.	Chemically impervious insulated gloves.	FR Garments Neoprene or nitrile apron.	Level of RPE required based on Atmospheric Monitoring.
Entering Line Heater (crystalline silica, refractory ceramic fibers)	As per assessment of all potential and existing hazards.	Leather gloves.	FR Garments Disposable FR coveralls, or follow appropriate hygiene practices.	Half-mask APR with P100 filter.
Operating Chainsaws or Metal Blade Weed Trimmers	Full-face shield or impact-resistant goggles (mesh face shields are recommended when operating chainsaws). Hearing protection.	Leather gloves	Kevlar leg chaps or pants. Footwear for chainsaw operation (CAN)	
Hand Removal of Asbestos Containing	Full-face shield and/or impact/chemical	Rubber coated gloves	Disposable hooded coveralls with elastic fittings	Half- mask APR with P100 filter.

	PPE (In addition to the minimum PPE required for all Enbridge Locations)			
Work Activity	**Eye, Face & Hearing**	**Hand**	**Body**	**Respiratory Protective Equipment** (These are the minimum requirements; a higher level of RPE may be required based on Atmospheric Monitoring)
Material – Including Coal Tar Pipe Coating	goggles.	Coal Tar – Chemically impervious gloves for longer than 1 hour of use or change nitrile gloves every 1 hour of used.	or coveralls are removed and laundered after each use. Rubber boots or disposable boots. Elasticized shoe covers Nitrile apron	
Chipping, Hammering Metal, Sledge or Jack Hammering; or Using Compressed Air; or Operating Electric and/or Hand Saws; or Concrete Work	Full-face shield and/or impact goggles. Hearing protection.	Leather or Kevlar gloves.	As per potential and existing hazards	As per potential and existing hazards. Consider type and quantity of particulates being generated.
Wire Brushing, Buffing, Cutting, Grinding (electric and pneumatic, including cut-off and concrete saws)	Welding helmet and safety glasses under helmet; or full-face shield or full-face shield and impact-resistant goggles. Hearing protection.	Leather gauntlet-type gloves (with seams on the inside).	Leather shoulder and sleeve covers.	As per potential or existing hazards.
Applying Herbicides and Pesticides	Chemical Splash goggles and/or full-face shield as required.	Chemically impervious gloves.	Disposable hooded coveralls.	Half-mask APR with OV cartridge with dust/mist pre-filter.
Vacuum Excavating	Full-face shield or impact goggles. Hearing protection.	Leather or Kevlar gloves.	As per potential or existing hazards.	As per potential or existing hazards.

	PPE (In addition to the minimum PPE required for all Enbridge Locations)				
Work Activity	**Eye, Face & Hearing**	**Hand**	**Body**	**Respiratory Protective Equipment** (These are the minimum requirements; a higher level of RPE may be required based on Atmospheric Monitoring)	
Oxy-Acetylene Welding or Cutting, Brazing or Soldering	Welder -welder/ cutter goggles (eye-cup/mono-frame); or -shade 3 or greater welding safety glasses c/w side-shields and face shield (a welding helmet with a flip-up lens can substitute a face shield); and -protective barrier skin cream (optional). Helper- same as welder. Hearing protection.	Leather gauntlet-type gloves (with seams on the inside).	Leather shoulder and sleeve covers.	Consider material being welded. Disposable P100 respirator or half-mask APR with P100 filter may be required.	
Arc Welding or Gouging	Welder-welding helmet, safety glasses c/w side-shields, and protective barrier skin cream (optional). Helper -as above; or -full-face shield and shade 3 or greater welding safety glasses c/w side-shields; or -full-face shield and shaded 3 or greater welder/cutter goggles. Hearing protection.	Leather gauntlet-type gloves (with seams on the inside).	Leather shoulder and sleeve covers.	Consider material being welded and review welding electrode SDS. Disposable P100 respirator or half-mask APR with P100 filter may be required.	
Abrasive Blasting Non-silica dust, metals, recycled glass/glass-based dust	Abrasive Blasting helmet or hood. Hearing protection.	Leather or Canvas gauntlet gloves.	Heavy duty blast suit or leather apron.	Blaster and helpers/workers in immediate vicinity of blasting: Type CE supplied air abrasive blasting respirator, hood or helmet with apron, operated in continuous flow mode.	
				Open Space	Helpers and workers in the blast area (within 30 m (100 ft.) downwind, 15 m (50 ft.) upwind, 23 m (70 ft.) if no wind); disposable P100 respirator or half-mask APR with P100 filter.
				Confined Space	Helpers and workers in the blast area same as Blaster.

	PPE (In addition to the minimum PPE required for all Enbridge Locations)					
Work Activity	**Eye, Face & Hearing**	**Hand**	**Body**	**Respiratory Protective Equipment** (These are the minimum requirements; a higher level of RPE may be required based on Atmospheric Monitoring)		
Abrasive Blasting Lead from lead-based paint	Abrasive blasting helmet or hood. Hearing protection.	Leather or canvas gauntlet gloves.	Heavy duty blast suit or leather apron.	Blaster and helpers/workers in immediate vicinity of blasting: Type CE supplied air abrasive blasting respirator, hood or helmet with apron, and with tight-fitting full-face mask operated in positive pressure mode.		
				Open Space	Helpers and workers in the blast area (within 30 m (100 ft.) downwind, 15 m (50 ft.) upwind, 23 m (70 ft.) if no wind); disposable P100 respirator or half-mask APR with P100 filter.	
				Confined Space	Helpers and workers in the blast area same as Blaster.	
Abrasive Blasting with Self-Contained System (e.g., Blastrac)	As per assessment of all potential and existing hazards.			Half-mask APR with P100 dust filter.		
High Pressure Water Jetting	Full-face shield Hearing Protection	Heat and water resistant gloves- Minimum Cut level 4	Metatarsal protection, knee length with ribbed steel shanks and heavy tread soles for nonslip traction. Additional PPE may be required based on potential and existing hazards.	As required by potential or existing hazards.		
Collecting Spent Abrasive Blasting Agent	Abrasive Blasting helmet or hood.	Chemically impervious gloves.	Disposable coveralls, or follow appropriate hygiene practices.	Open Space	Very dusty air	0 to 0.5 hrs after abrasive blasting: Type CE supplied-air abrasive blasting respirator, hood or helmet, with apron operated in continuous flow mode.
						> 0.5 hrs after abrasive blasting: disposable P100 respirator or half-mask APR with P100 filter.
					Moderately dusty air	Disposable P100 respirator or half-mask APR with P100 filter.
					No visible dust	0 to 0.5 hrs after abrasive blasting: disposable P100 respirator or half-mask APR with P100 filter.
						More than 0.5 hrs after abrasive blasting: none.
				Confined Space	Very dusty air	0 to 0.5 hrs after abrasive blasting: Type CE supplied-air abrasive blasting, hood or helmet, with apron operated in continuous flow mode

	PPE (In addition to the minimum PPE required for all Enbridge Locations)					
Work Activity	**Eye, Face & Hearing**	**Hand**	**Body**	**Respiratory Protective Equipment** (These are the minimum requirements; a higher level of RPE may be required based on Atmospheric Monitoring)		
						> 0.5 hrs after abrasive blasting: disposable P100 respirator or half-mask APR with P100 filter.
					Moderately dusty air	Disposable P100 respirator or half-mask APR P100 filter.
					No visible dust	0 to 2 hrs after abrasive blasting: disposable P100 respirator or half-mask APR with P100 filter.
						> 2 hrs after abrasive blasting: none.
Induced Voltage (piping, valves, casing and measuring equipment)	As per assessment of all potential and existing hazards.	Voltage Rated gloves with leather protectors.	FR Clothing[2] with a label stating a minimum Arc Rating (AR) of 8cal/cm^2			
HRC 0 Electrical Work[4]	Safety glasses c/w side-shields. Ear canal inserts (i.e. ear plugs).	Heavy duty leather gloves unless Arc Flash Label specifically states Voltage Rated gloves with leather protectors.[3]	FR Clothing[2] with a label stating a minimum Arc Rating (AR) of 8cal/cm^2. Leather footwear meeting Foot Protection requirements. See 7.5 Foot Protection.			
HRC 1 Electrical Work[4]	Safety glasses c/w side-shields or impact resistant goggles; and a face shield with a minimum Arc Rating (AR) of 8 cal/cm^2 with wrap-around guarding or a flash suit hood. Ear canal inserts (i.e. ear plugs).	Heavy duty leather gloves unless Arc Flash Label specifically states Voltage Rated gloves with leather protectors.[3]	FR Clothing[2] with a label stating a minimum Arc Rating (AR) of 8 cal/cm^2. Leather footwear meeting Foot Protection requirements. See 7.5 Foot Protection.			
HRC 2 Electrical Work[4]	Safety glasses c/w side-shields or impact resistant goggles; and a face shield with a minimum Arc	Heavy duty leather gloves unless Arc Flash Label specifically	FR Clothing[2] with a label stating a minimum Arc Rating (AR) of 8 cal/cm^2.			

	PPE (In addition to the minimum PPE required for all Enbridge Locations)			
Work Activity	**Eye, Face & Hearing**	**Hand**	**Body**	**Respiratory Protective Equipment** (These are the minimum requirements; a higher level of RPE may be required based on Atmospheric Monitoring)
	Rating (AR) of 8 cal/cm^2 with wrap-around guarding and balaclava or flash suit hood. Ear canal inserts (i.e. ear plugs).	states Voltage Rated gloves with leather protectors.[3]	Leather footwear meeting Foot Protection requirements. See 7.5 Foot Protection.	
HRC 3 Electrical Work[4]	Safety glasses c/w side-shields or impact resistant goggles; and arc rated flash suit hood. Ear canal inserts (i.e. ear plugs).	Voltage Rated gloves.[3]	Arc flash suit[2] with a minimum Arc Rating (AR) of 25 cal/cm^2. Leather footwear meeting 6.5 Foot Protection requirements. See 7.5 Foot Protection.	
HRC 4 Electrical Work[4]	Safety glasses c/w side-shields or impact resistant goggles; and arc rated flash suit hood. Ear canal inserts (i.e. ear plugs).	Voltage Rated gloves. [3]	Arc flash suit[2] with a minimum Arc Rating (AR) of 40 cal/cm^2. Leather footwear meeting Foot Protection requirements. See 7.5 Foot Protection.	

Notes:

1. Safety glasses c/w side shields shall always be worn under a full-face shield and under non-impact resistant chemical splash goggles.
2. Avoid wearing garments made from flammable synthetic material under FR Arc Rated clothing as they can melt to the skin in an arc flash. This includes acetate, acrylic, nylon, polyester, polyethylene, polypropylene and spandex, either alone or in blends.
3. Higher class Voltage Rated gloves with leather protectors provide increased arc flash protection due to the increase in material thickness.
4. The Hazard Risk Category (HRC) has been revised and will no longer be the determining factor in PPE selection for electrical work. The old Arc Hazard labels will be replaced with the labels shown in Figure 1 of section 13.1, which references the PPE selection in Table 2 below

   Voltage Rated Gloves:
   - Class 00 up to 500V AC
   - Class 0 up to 1000V AC
   - Class 1 up to 7,500V AC
   - Class 2 up to 17,000V AC
   - Class 3 up to 26,500V AC
   - Class 4 up to 36,000V AC

At a minimum, safety glasses complete with side-shields shall always be worn under a full-face shield and under non-impact resistant chemical splash goggles.

Table 2- Guidance on Selection of Arc-Rated Clothing and Other PPE for Use When Incident Energy Exposure Is Determined

Incident Energy Exposure ≤ 1.2 cal/cm^2	**Protective Clothing and PPE**
Protective clothing, nonmelting (in accordance with ASTM F1506) or untreated natural fiber	Shirt (long sleeve) and pants (long) or coverall
Other PPE	• Face shield for projectile protection (AN) • Safety glasses or safety goggles • Hearing protection • Heavy duty leather gloves or rubber insulating gloves with leather protectors (AN)
Incident Energy Exposure ≥ 1.2 to 12 cal/cm^2	**Protective Clothing and PPE**
Other PPE	• Hard hat • Arc-rated hard hat liner (AN) • Safety glasses or safety goggles (SR) • Hearing protection • Heavy-duty leather gloves or rubber insulating gloves with leather protectors (SR) (See Note 4.) • Leather footwear
Incident Energy Exposure > 12 cal/cm^2	**Protective Clothing and PPE**
Arc-rated clothing and equipment with an arc rating equal to or greater than the determined incident energy *(See Note 3.)*	• Arc-rated long-sleeve shirt and arc-rated pants or arc-rated coverall and/or arc flash suit (SR) • Arc-rated arc flash suit hood • Arc-rated gloves • Arc-rated jacket, parka, or rainwear (AN)
Other PPE	• Hard hat • Arc-rated hard hat liner (AN) • Safety glasses or safety goggles (SR) • Hearing protection • Arc-rated gloves or rubber insulating gloves with leather protectors (SR) (See Note 4.) • Leather footwear

AN: As needed [in addition to the protective clothing and PPE required by NFPA 70E –2015, 130.5(C) (1)] for U.S. facilities or CSA Z-462-2015 Clause 4.3.7.3. for Canadian facilities.

SR: Selection of one in group is required by NFPA 70E –2015, 130.5(C) (1) for U.S. facilities or CSA Z-462-2015 Clause 4.3.7.3.4 for Canadian facilities.

Notes: (1) Face shields with a wrap-around guarding to protect the face, chin, forehead, ears, and neck area are required by NFPA 70E –2015, 130.7(C)(10)(c) for U.S. facilities or CSA Z-462-2015 Clause 4.3.7.3.10 for Canadian facilities. For full head and neck protection, use a balaclava or an arc flash hood.

(2) All items not designated “AN” are required by NFPA 70E –2015, 130.7(C) for U.S. facilities or CSA Z-462-2015 Clause 4.3.7.3 for Canadian facilities.

(3) Arc ratings can be for a single layer, such as an arc-rated shirt and pants or a coverall, or for an arc flash suit or a multi-layer system consisting of a combination of arc-rated shirt and pants, coverall, and arc flash suit.

7.2 **Head Protection**

Head protection shall be worn when specified by the Hazard Assessment. At a minimum, Class E-approved industrial head protection (hard hats) shall be worn at all times on Enbridge Worksites except when:

- actively engaged in welding where overhead hazards have been eliminated
- sheltered in a vehicle or equipment with an enclosed cab
- the Worker is already wearing a helmet and the work does not subject the Worker to potential contact with exposed energized electrical sources
- getting in or out of helicopters, or when working near helicopters under full throttle (unless the helicopter is involved in slinging operations)

- working in, on, or near Open Water, as determined by an Incident Commander when under the Incident Command System (ICS)
- operating small utility vehicles equipped with seatbelts and roll-over protection that meets legislative requirements
- in control rooms, offices, lunch rooms or change rooms
- when visiting landowners and overhead hazards are not present or have been eliminated

If side impact is identified as a hazard to Workers then a side-impact-rated hard hat shall be worn.

Baseball caps (or similar) are prohibited from being worn underneath a hardhat. Cowboy style hardhats are prohibited on Enbridge property.

Prior to each use, hard hats or other head protection shall be visually inspected for cracks, weaknesses, or damage to the shell or suspension system. A hard hat or other head protection shall be replaced at the first indication of any of these conditions.

Workers shall not cover cracks in the hard hat shell with paint or stickers, nor clean a hard hat with solvents.

Note that exposing a hard hat to temperatures over 50°C (122°F) degrades the hard hat shell over time. This significantly reduces its useful life and may cause the shell to fail upon impact.

Enbridge Workers shall NOT:

- apply products to the hard hat that may degrade or weaken the hard hat shell or component materials (e.g., do not apply insect repellant)
- place hard hats on or near heat sources (e.g., radiator), nor in locations where heat from the sun may be intense (e.g., vehicle dashboard)

DOT- or Snell-approved helmets are required at all times while on or operating All-Terrain Vehicles (ATVs), Utility-Terrain Vehicles (UTV's) and Snowmobiles.

The exceptions for UTV's shall be where the UTV is equipped with seatbelts with shoulder straps and an appropriately rated Roll-Over Protective Structure (ROPS) and all occupants are wearing seatbelts with shoulder straps during the operation of the vehicle.

To confirm if the UTV has an appropriately rated ROPS, consult the owner's manual or the manufacturer.

Workers who wear approved helmets while using a Snowmobile or off-road vehicle may continue to wear the helmet when working at a Site provided that the work activity does not subject the Worker to potential contact with exposed energized electrical sources and the work is done for a short period of time (e.g., gauging work).

Workers using bicycles at Enbridge Locations shall:

- wear a cycling helmet approved by CSA, CPSC, Snell or ANSI; or
- if travelling 20 km/hr. (12 mph) or less, may wear a Class E hard hat including a fastened chin strap

7.3 **Eye and Face Protection**

Workers shall wear approved safety glasses with side shields at all times while working on any Enbridge Worksite, except when:

- in a vehicle or equipment with an enclosed cab
- in a control room, office, lunch room or change room

All safety glasses shall have side shield protection that is integrated or permanently affixed to the frame.

Safety glasses shall not be worn under a full-face respirator and chemical splash goggles as a seal cannot be made; therefore all full-face respirators and chemical splash goggles shall be impact-rated.

To determine the safe use contact lenses when handling chemicals, refer the chemicals SDS for specific precautions.

An arc flash suit should have a ventilation system to prevent fogging of the face shield and overheating of the Worker.

An approved welding helmet with a flip-up lens can be used as an alternative to a face shield.

If a worker is using safety glasses or prescription safety glasses and a face shield at a work location where fogging of the eyewear or shield is a hazard, then the Worker shall use an anti-fogging solution, as conditions may require.

Eye and face protection equipment may be both ANSI- or CSA-approved. Such PPE is approved if it meets:

- CAN/CSA Z94.3 requirements in Canada; and
- ANSI/ISEA Z87.1 requirements in the USA.

Full-face respirators and chemical splash goggles shall meet the above-noted minimum eye protection Standards. Prescription spectacle inserts are available for full face respirator use to ensure facial seal for Workers who require prescription eyewear.

The “pancake” style of helmets sometimes worn by welders shall be ANSI approved when worn on Enbridge Locations. Shading and welding filters shall meet the minimum Applicable Legislative requirements.

See Table 1 and 2 for minimum marking requirements.

Table 1 ANSI/ISEA Z87.1 Minimum Eye Protection Marking Requirements

Spectacle Lenses	Other Lenses	Frame/ Temple/ Headgear
Shall have: • Manufacturer’s Mark or Logo • “+” if Impact Rated	Shall have: • Manufacturer’s Mark or Logo • “Z87” • “+” if Impact Rated	Shall have: • Manufacturer’s Mark or Logo • “Z87” Plano or “Z87-2” Rx • “+” if Impact Rated

Table 2 CSA Z94.3 Minimum Eye Protection Marking Requirements

Lenses	Frame/ Temple/ Headgear

Shall have: • Manufacturer's Mark or Logo	Shall have: • Manufacturer's Mark or Logo • "CSA Z94.3"

7.4 **Hand Protection**

Hand protection shall be worn at all times on Enbridge field Worksites.. Hand protection shall be appropriate to the task being performed and include consideration of factors such as abrasion, dexterity, punctures and sharp edges, chemicals, crushing, temperature (hot and cold), vibration and general duty.

Specific hand protection may be required when engaged in the following:

- construction Worksite activities
- working with fixed open-blade knives
- walking in areas where there is a high potential for slips, trips or falls
- performing Hot Work, welding, cutting, sandblasting, grinding and buffing
- material handling
- handling chemicals
- working on energized systems
- work in cold or freezing temperatures

For electrical work, test and check voltage rated rubber gloves as follows:

- before each use, check for cracks and air leaks
- discard arc-rated rubber gloves that fail an air-leak test
- test for voltage at least twice a year (time between tests not to exceed 6 months)
- testing shall be done at a specified voltage by an authorized testing company

Voltage rated rubber gloves that have been tested for voltage shall be marked with the date of the test and the test voltage.

Voltage Rated Rubber Gloves

Class	Use
Class 00	Use for circuits up to 500 volts AC
Class 0	Use for circuits up to 1000 volts AC
Class 1	Use for circuits up to 7,500 volts AC
Class 2	Use for circuits up to 17,000 volts AC
Class 3	Use for circuits up to 26,500 volts AC
Class 4	Use for circuits up to 36,000 volts AC

7.5 **Foot Protection**

Protective footwear shall:

- have a minimum 15 cm (6 in.) ankle support and protection, i.e., 15 cm (6 in.) to the top of the boot from the heel
- be worn at all times when performing work that requires foot protection (except when in control rooms, lunch rooms, offices, or change rooms)
- provide sufficient protection against injury to the feet and ankles, as appropriate for the work environment and assessed hazards

Appropriate protective footwear shall be required for any job where additional foot or leg protection is necessary, depending on the work environment and assessed hazards. Some examples of factors to consider include:

- presence of water
- presence of chemical hazards
- electrical hazards, e.g., omega symbol or Electrical Hazard symbols
- impact hazards (e.g., portable equipment impact); consider PPE such as metatarsal or shin guards

Weather conditions may also lead to potential hazards. Consider the hazards that may be present in each season. For instance, during winter conditions, consider PPE such as:

- slip-resistant rubber, Vibram™ Fire & Ice, thermoplastic polyurethane (TPU compound), or Oarprene sole that maintains traction in cold weather
- removable, easily fitted traction/grip aids (outdoor use only)
- thermally insulated footwear, with a removable inner-boot system
- work-boot insulators and/or liner

Where foot protection does not mitigate the primary hazard associated with the work (such as when slope reading), then alternative footwear appropriate for the hazards should be considered and may be used if approved by the Regional Director.

Workers and Visitors may be exempt from the requirement for protective footwear only if:

- they are on a supervised or controlled tour of a Site or Facility; or
- if they are visiting a Site or Facility for administrative reasons only, and while there, are not exposed to hazards that would require the foot protection set out in this section 7.5

Protective footwear shall have markings as required, as shown in Table 1, by jurisdiction.

Table 1 Protective Footwear Markings

	Canada	USA
General hazards	CSA 1 (Green Triangle)	ANSI Class 75
Electrical work or entering substations	omega symbol (Ω)	Electrical Hazard (EH)
Chainsaw work	white label with green fir tree symbol	---

7.6 Hearing Conservation

Workers who are exposed to noise at 85 dBA or above shall wear hearing protection.

Enbridge shall ensure appropriate hearing protection is provided and available to Workers at each Worksite, and that the protection is properly used and maintained, in accordance with manufacturers' specifications.

Enbridge shall carry out hearing conservation measures for employees exposed to noise at levels:

- greater than or equal to (≥) 82 dBA of an 8 hr. TWA; or
- greater than (>) 115 dBA at any time

Contractors shall have a hearing conservation program where required and are responsible for providing their employees with the required testing and any required hearing protection.

Enbridge is responsible for the following hearing conservation measures for Enbridge Employees:

- coordinating hearing conservation training as required
- identifying potential noise hazards (e.g., new equipment, noise sources) or changes that may affect noise exposure assessments
- ensuring noise-hazardous areas and equipment are identified, including areas where additional hearing protection is required
- identifying and implementing engineering controls to reduce noise levels, wherever practicable

Audiometric Testing

Enbridge shall be responsible for the following, for employees:

- arranging audiometric testing with the testing agency, including initial, ongoing and follow-up testing or evaluation when required
- participating in reviewing abnormal test results, as necessary
- providing Workers with forms and information needed for audiometric testing (in the US the testing agency provides Workers with forms and information needed)

All Workers are responsible for:

- attending audiometric testing as required
- following up with their personal physician if abnormal test results are received from the Testing Agency
- attending follow-up tests or other medical evaluation if required by the testing agency, Enbridge Medical Director or the Worker's personal physician

All audiometric tests for Enbridge Employee's shall be paid for by Enbridge and Workers shall be granted time off during normal working hours to attend appointments.

The Enbridge Corporate Health & Safety Department is responsible for:

- conducting noise exposure assessments and re-assessments and recommending hazard controls as required
- assisting in selecting, fitting and using appropriate hearing protection
- ensuring employee audiometric test result records are provided to the testing agency for ongoing testing
- liaising with Enbridge's medical director, testing agency, regional safety coordinator and Worker regarding test result records including safety concerns and any follow-up testing or further evaluation required
- maintaining summaries of audiometric test results for Enbridge Employees in Canada (US Human Resources maintains summaries of US Workers' audiometric test results)
- reviewing abnormal test results where there is a safety concern (Canada)

Additional Hearing Protection Measures

Noise exposure assessments for Workers are recommended when:

- there are indicators that noise levels from equipment or other sources are:
    - greater than or equal to (≥) 82 dBA of an 8 hr. TWA; or
    - greater than (>) 115 dBA at any time
- there has been a change that may make the hearing protection inadequate (e.g., equipment changes; changes to job tasks or Worker assignments, such that use of hearing protection needs to be reviewed)
- audiometric testing of a Worker shows there is a Standard Threshold Shift (STS)

Areas and fixed equipment with noise levels greater than (>) 82 dBA shall be identified and marked with posted signs.

Hearing protection shall be worn as follows:

- in work areas where hearing protection signage is posted, when equipment is operating
- when operating any piece of equipment where the noise level is greater than (>) 85 dBA
- when exposed to noise levels greater than or equal to (≥) 105 dBA, Workers shall wear both ear plugs and ear muffs
- when working on electrical equipment with a Hazard/Risk Category (HRC) of 0, 1, 2, 3 or 4, Workers shall wear ear canal inserts (i.e., ear plugs)

Enbridge provides approved hearing protection for employees at all Enbridge Locations. For assistance in selecting appropriate hearing protection, contact the Corporate Health & Safety Department.

All new Workers who may be exposed to noise hazards at greater than or equal to (≥) 85 dBA shall receive a baseline audiometric test within 6 months of being hired.

Prior to establishing a baseline audiogram for a Worker, the Worker shall have gone at least 14 hours without being exposed to workplace noise.

If a Standard Threshold Shift has occurred the Worker shall to be notified in writing within 21 days of the determination.

In addition to baseline testing, Workers who continue to be exposed to workplace noise shall receive ongoing audiometric testing according to the following table. If regulatory requirements are more stringent, they shall be followed.

	Canada	USA	EPSI	APLI
Frequency	5 years	1 year	2 years	2 years

Additional testing may be requested by the medical director (retained by Enbridge), the testing agency or the employee's physician.

Records shall be maintained according to Enbridge's Record Management Policy and Records Retention Schedule in the following locations:

- Enbridge Worker Audiometric Testing Results
    - Enbridge-contracted occupational health nurse [CAN]
    - testing agency [USA]

Audiometric test results are confidential. Results are accessible only to Enbridge's Medical Director and the Worker tested, unless the Worker provides written consent to disclose the results to a third party or if disclosure is required by law.

7.7 High-Visibility Safety Apparel

High-Visibility Safety Apparel (HVSA) shall be worn by Workers when required by a Hazard Assessment, Worksite requirements and/or regulatory requirements.

HVSA serves to alert drivers and other vehicle/equipment operators of a Worker's presence, especially in low light or darkness.

High visibility headwear can also be worn to increase a Worker's visibility in situations where part or all of the Worker's body could be obscured, e.g., due to trees, traffic barriers, objects, vehicles or construction materials.

There are three classes of HVSA based on body coverage provided. Each class covers the torso (waist to neck) and/or limbs according to the minimum body coverage areas specified for each class.

Class 1 provides the lowest recognized coverage and visibility. Class 1 does not provide adequate protection for use at Enbridge Locations.

Class 2 provides moderate body coverage and superior visibility and is the minimum HVSA to be worn when HVSA is required. Class 2 HVSA shall be worn when:

- working as a designated Signaler/Spotter
- working on or adjacent to roadways with traffic speeds under 80 km/hr. (50 mph)
- working around Powered Mobile Equipment
- working on active construction sites
- operating ATV's, UTV's and Snowmobiles
- working in low light or inclement weather conditions
- determined by the Hazard Assessment

Class 3 provides the greatest body coverage and visibility, including visibility from a distance and under low light conditions. Class 3 HVSA shall be worn:

- when working on or adjacent to roadways with traffic speeds above 80 km/hr. (50 mph)
- by traffic control personnel
- as determined by the Hazard Assessment

Level FR HVSA shall be worn when required by the Hazard Assessment.

7.8 Flame Resistant Garments

Workers shall wear Flame Resistant (FR) Garments according to this Standard and maintain them in accordance with the manufacturers' specifications. FR Garments are required to be worn as daily work wear when:

- inside fenced or operating Facilities
- working within 30 m (100 ft.) of an Open System
- working within 30 m (100 ft.) of Ground Disturbance/Excavation that contains an operating pipeline
- any other work where there is the potential for flash fires or short duration flame exposures identified on the Hazard Assessment

Exceptions include:

- low-risk areas, including office buildings and areas on the ROW identified by the Site Supervisor
- controlled vehicle or escorted tours where risks are eliminated by a Enbridge Representative

Additional FR Garment Requirements

FR Garments shall meet all of the requirements detailed in Enbridge's Flame Resistant Garment Requirements and Specifications document, found in the GDL (under IMS-04 Tier Processes).

The outer layer of FR Garments provided by Enbridge for Enbridge employees shall be a minimum Arc Thermal Protection Value (ATPV) of 8 Cal/cm^2 (HRC 2).

FR Garments for electrical Workers shall meet the minimum ATPV of 8 Cal/cm^2 (HRC 2) and increase the level of protection as required by Arc Flash hazards.

Contractors shall supply FR Garments that meet the minimum requirements in NFPA 2112 for their employees.

FR Garments shall:

- be worn with collars closed and sleeves and cuffs worn down and secured
- be kept reasonably free from hydrocarbon products like grease and oil

- cleaned frequently enough to prevent build-up of contaminants that reduce flame resistance
- be worn as the outer garment and shall fully cover any non-FR garments worn when FR Garments are required
- not have insect repellents containing DEET applied or sprayed directly on FR Garments as it will negatively impact the flame resistance of the garments
- be stored in accordance with manufacturer instructions
- be inspected prior to use considering the following criteria:
    - fabric damage
    - damage to threads or seams including skipped, broken of missing stitches
    - damage to and functionality of all hardware such as zippers, buttons, snaps, and other fasteners
    - remove damaged FR Garments from service immediately

Workers should wear only clothing made with a natural fiber (e.g., cotton, wool) or approved FR undergarments below FR outerwear.

If other safety hazards or concerns (e.g., exposure to asbestos, corrosive materials) exceed the fire hazard, then non-flame-resistant outerwear may be worn over approved FR clothing.

FR Garments are limited to protection against unplanned exposure to intense heat transfer for three seconds or less. If the existing or potential hazards are for other thermal energy types (e.g. steam) or longer heat transfer, additional PPE needs are to be determined.

Laundering of FR Clothing

Follow the laundering instructions and temperature limits for FR Garments identified on the garment care tag. When possible, send FR Garments to a professional laundering service that is knowledgeable in the proper care of FR Garments, especially if they garments are contaminated.

Dispose of contaminated FR Garments if no instructions for decontamination are provided.

Do not use chlorine bleach, fabric softeners or a combination of hydrogen peroxide with hard water when laundering FR Garments as it may compromise the flame resistant properties in the fabric, weaken the fabric and result in color loss over time. FR Garments shall also be kept free from exposure to oxidizing chemicals (e.g., OxiClean).

Follow manufacturer’s recommendations on service life and dispose of retired FR Garments in a manner that ensures the garments can no longer be used.

7.9 **Respiratory Protective Program**

For protection from airborne contaminants, Workers shall wear Respiratory Protective Equipment (RPE), in accordance with this Standard. Airborne contaminants and hazards can include, but are not limited to:

- particulates (asbestos, silica)
- O_2 deficiency
- fumes
- gases or vapors
- smoke
- sprays

Workers may be required to wear any of the following, depending on the potential hazard:

- Self-Contained Breathing Apparatus (SCBA)
- Supplied-Air Respirator (SAR) or Supplied-Air Breathing Apparatus (SABA)
- Air-purifying respirators (APR) (full-face, half-mask, or disposable)

Contractors shall have a written respiratory protection program that meets or exceeds this Standard and all Applicable Legislation and provide their employees with all required respiratory equipment.

All SCBA shall be of the positive pressure type.

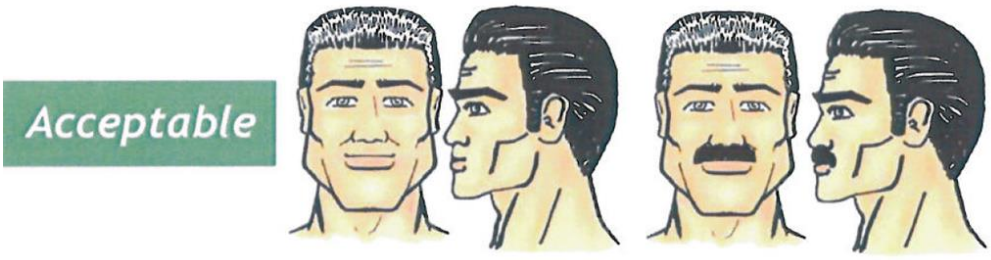
Continuous monitoring of the work area shall occur to ensure atmospheric conditions don't change. If atmospheric conditions change, the Hazard Assessment shall be updated and additional controls, including reassessing the level of RPE being used.

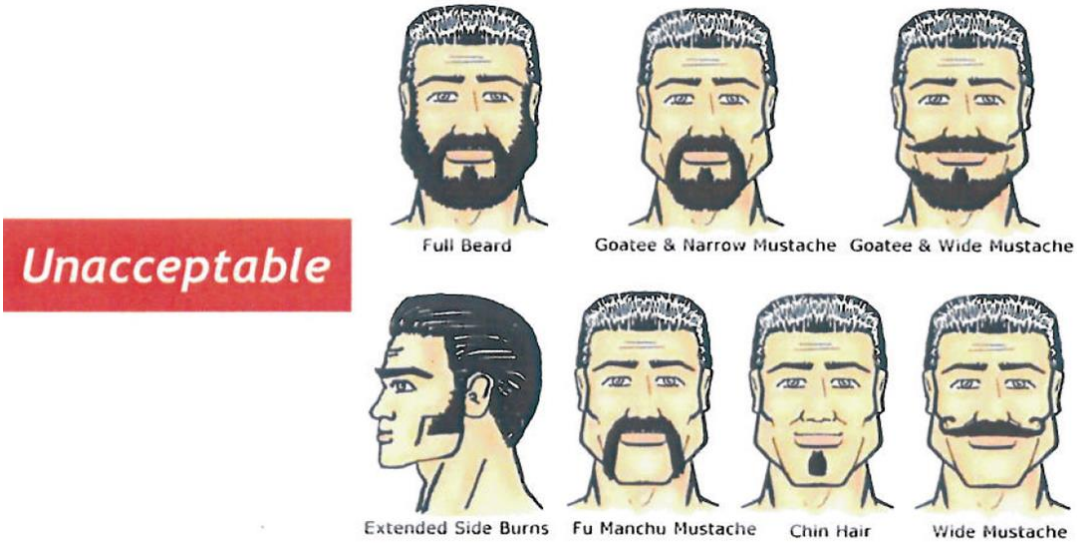
Appropriate surveillance shall be maintained of work area conditions and degree of Worker exposure or stress. When there is a change in work area conditions or degree of Worker exposure or stress that may affect respirator effectiveness, the Site Supervisor shall reevaluate the continued effectiveness of the respirator.

Disposable, single use non-tight fitting respirators are permitted for nuisance level particulates only, provided that the potential contaminant has been evaluated by an Industrial Hygienist and deemed inert/non-toxic.

Workers who may be required to wear RPE that depends on an effective seal shall be clean-shaven where the face piece contacts the skin; this may require trimming or removing goatees, full beards, narrow beards, extended side burns, Fu Manchu moustaches, chin hair or wide moustaches (see figure 1).

Figure 1





Workers required to wear tight fitting respirators shall:

- be fit tested and trained on each brand, size and model of respirator they may be required to wear (fit test certificates are required and the fit test validity timeline shall be on the certificate)
- select the proper equipment based on the potential and existing hazards, taking into consideration gas/particle monitoring results, MSDS/SDS requirements, physical conditions, and work to be conducted, including:
    - review and understand the completed Hazard Assessment and;
    - ensuring the respirator selected is appropriate for the chemical state and physical form of the contaminant
- be provided the appropriate RPE
- perform a positive and negative pressure user seal check, prior to use
- inspect and maintain RPE in accordance with manufacturers' specifications, including a visual inspection before and after each use
- store respirators in clean plastic bags in a manner that prevents contamination and damage to the equipment or labeling, as required
- use only respirators approved by the National Institute for Occupational Safety and Health (NIOSH) or the Canadian Standards Association (CSA)
- select or change the RPE used, based on results of contaminant/hazard monitoring and updated results; leave the respirator use area if vapor or gas breakthrough is detected, or if there are changes in breathing resistance, or leakage of the face piece
- ensure that shared RPE is disinfected after each personal use
- ensure personal and shared RPE is cleaned in accordance with manufacturers' specifications

Fit testing is to be provided to Contractor personnel by their respective employer.

In addition, Workers shall complete medical evaluations. A medical evaluation is required:

- every five years [CAN]
- every 2 years [APLI]
- annually [USA]

Medical evaluations will include a pulmonary function test or spirometry test. The evaluations are reviewed by a licensed health care professional. The licensed health care professional shall review and retain the medical evaluation and ensure that:

- a recommendation regarding the Workers ability to use a respirator is clearly stated
- any limitations on respirator use related to medical conditions or workplace conditions in which the respirator will be used are clearly stated
- the medical care provider has provided the Worker with a copy of the written recommendation(s)

Additional medical evaluations will be completed before the noted time frame set out above if:

- an employee reports medical signs or symptoms that may affect their ability to wear a respirator
- a People Leader notifies the Corporate Health & Safety Department that an employee may need to be re-evaluated
- observations made during fit testing indicate the need for re-evaluation
- there is a change in workplace conditions that may result in an increased physiological burden placed on an employee

Contractor Personnel shall provide proof of medical evaluation upon request.

RPE Selection and Permitted Work for Known Exposure Concentrations

When opening petroleum systems where a known potential for exposure exists, all Workers in the immediate work area shall wear the appropriate RPE, in accordance with the completed Hazard Assessment until a safe atmosphere has been verified.

If the concentration of the contaminant is unknown or there is a potential for a hazardous atmosphere (e.g., work around Open Systems), assume the atmosphere is hazardous, perform exposure assessments and use RPE in accordance with Table 1.

Planned work shall not take place in Immediately Dangerous to Life and Health (IDLH) environments. If an IDLH environment exists, or has potential to exist, then work shall stop until controls are in place to eliminate, control or minimize the hazards to an acceptable level.

Table 1-RPE for Exposure Concentrations

Respiratory Hazard	Exposure Concentration	Respiratory Protection
Asbestos	<1 f/cc	half-mask APR with P100 filter
	1 to 10 f/cc	full-face APR with P100 filter
	10 to 100f/cc	full-face PAPR with P100 filter or SAR
	<1000f/cc	positive demand or positive pressure SCBA
Benzene	0 to 0.5 ppm	none
	0.6 to 5 ppm	half-mask APR with OV cartridge
	6 to 25 ppm	full-face APR[1] with OV cartridge or SAR
	greater than (>) 25 ppm	SCBA or SAR
	greater than (>) 500 ppm (IDLH)[2]	planned work is not permitted[3]
Carbon monoxide	25 ppm to 500 ppm	SCBA or SAR
	greater than (>) 500 ppm	planned work is not permitted[3]
Hydrogen Sulfide (H_2S) [4]	0 to 10 ppm	none
	11 to 99 ppm[5]	SCBA or Type C SAR with escape pak[6]
	greater than (>)100 ppm (IDLH)[2]	Planned work is not permitted[3]
Lead (0.05mg/m3)	<0.5 mg/m^3	half mask APR with P100 filter
	0.05 to 5 mg/m^3	full face APR with P100 filter
	5 to 50 mg/m^3	full face PAPR with P100 filter or SAR
	50 to 100 mg/m^3	Positive demand or positive pressure SCBA
	greater than or equal to (≥) 100mg/m^3	planned work is not permitted
Mercaptans	0 to 0.5 ppm	none
	0.6 to 5 ppm	half-mask APR with OV cartridge
	6 to 25 ppm	full-face APR[1] with OV cartridge or SAR
	greater than (>) 25 ppm	SCBA or SAR

	greater than (>) 500 ppm (IDLH)[2]	planned work is not permitted
Natural gas	0 to 10% LEL	none
	11 to 20% LEL	SCBA for cold work; hot work is not permitted[6]
	greater than (>) 20%	planned work is not permitted[3]
Oxygen deficiency	less than (<) 19.5%	SCBA
Petroleum vapors	less than (<) 3% LEL	none
	greater than or equal to (≥) 3% LEL to less than (<) 10% LEL	half-mask APR with OV cartridge
	greater than or equal to (≥) 10% LEL to less than (<) 20% LEL	SCBA (or equivalent) for cold work; hot work is not permitted
	greater than or equal to (≥) 20% LEL (IDLH)	planned work is not permitted[3]
Silica (Exposure Limit .025)	<0.25mg/m^3	half-mask APR with P100 filter
	0.25 to 2.5mg/m^3	full-face APR With P100 filter
	2.5 to 25mg/m^3	full-face PAPR with P100 filter or SAR
	greater than or equal to (≥) 25mg/m^3 (IDLH)	planned work is not permitted

1 If quantitative fit test performed.
2 Immediately Dangerous to Life and Health (IDLH)
3 Emergency work is allowed if SCBA or SAR with escape pack is used and all ignition sources are eliminated. Additional requirements for entering buildings can be found in section 4.18
4 If the concentration exceeds the maximum detection limit of the H_2S detector, planned work is not permitted until the concentration has been verified.
5 Where possible, reset gas detectors monitoring H_2S to alarm at 10 ppm (low level) and 100 ppm (high level).
6 Natural gas is composed of 95% methane. Methane is a simple asphyxiate; therefore does not have an allowable exposure limit. Methane displaces oxygen in the atmosphere; therefore, entry into areas where oxygen levels are less than (<) 19.5% require SCBA.

To avoid working in IDLH environments, use the hierarchy of controls to mitigate atmospheric hazards. If the hierarchy of controls does not mitigate atmospheric hazards to an acceptable level, then Enbridge Employees shall use the IDLH work procedure found in the GDL (under IMS-04 Tier 2 procedures).

Workers wearing SCBA or SAR with escape pack shall:

- be properly trained and fit tested prior to using the equipment

- leave the area containing the hazardous atmosphere when the alarm sounds or when 20–25% of the operating time remains (SCBA)
- not remove the face mask while in the area containing the hazardous atmosphere

Monthly, Workers shall inspect and record information about SCBA and SAR escape packs. The inspection and information shall include labeling each respirator or storage bag with:

- inspection date
- name of Worker completing the inspection
- findings, including remedial action required
- serial number or other identification

SCBA and SAR escape pack inspection records shall be kept on-site for one year.

Workers wearing Air Purifying Respirators (APR) shall replace cartridges when:

- used for escape from H_2S concentrations greater than (>) 10 ppm
- it is damaged
- there is odor breakthrough
- cartridge is past the expiration date
- Organic Vapor (OV) Acid Gas (AG) cartridges have been used continuously for 10 hrs. or 30 days, whichever comes first
- usage exceeds manufacturers specifications
- Hazard Assessment determines cartridges require replacement

Workers shall:

- leave the area to change cartridges
- leave the area if a break-through or resistance is detected when using a respirator
- replace filters when plugged, damaged or soiled or when breathing is difficult

If used in environments containing oil aerosols, the Worker shall replace an oil-resistant filter after a total of 40-hrs use or 30 days, whichever comes first.

Workers shall maintain personal hygiene as required to mitigate eye and/or skin irritation associated with respirator use.

Supplied Breathing Air and Systems Requirements

Workers using supplied air systems shall have a bottle watch to ensure constant breathing air supply to Workers at all times when using supplied air. The exception to this rule is when the Worker using supplied air is able to hear the alarm and view the gauges on the air panel of the bottle.

Compressed breathing air and systems used to supply breathing air to RPE shall meet the requirements of:

- CSA Z180.1 Compressed breathing air and systems (CAN), and/or
- ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1 (USA) (OSHA 1910.134(i)(1)(ii))

Using supplied-air breathing equipment during cold weather can present difficulties due to the moisture in the stored/supplied air, the moisture in the user's exhaled breath, and lack of visibility through the mask. Warm up the supplied-air equipment prior to use, to ensure that no condensation forms by using cold equipment.

The compressed breathing air shall be sampled and analyzed as per industry standards and Applicable Legislation. The air quality analysis results shall be readily available. Compressed breathing air and systems shall be inspected and maintained in accordance with manufacturers' specifications, Applicable Legislation and industry standards. Written records of analysis results, inspections and maintenance shall be kept according to the record retention policy.

Carbon monoxide levels shall be continuously monitored with an in-line monitoring system for compressed breathing air systems using oil-lubricated compressors. This in-line monitoring system shall consist of:

- audible or/and visible alarms at 5 ppm
- detection limit of 1 ppm and a resolution of at least 1 ppm
- an inspection, maintenance and calibration program in accordance with manufacturers' specifications

In-line carbon monoxide monitoring is not required for ambient air systems or compressed breathing air systems comprised of compressed breathing air cylinders which have been filled in accordance with the Applicable Legislation.

Oil-lubricated air compressors used as a component of a compressed breathing air system shall:

- have fail-safe switches that will activate audible and visual alarms, shut down the compressor, and prevent automatic restart when either the compressor's oil pressure is low or temperature is high
- have a high pressure shutdown switch
- have check valves to prevent feedback of purified air
- have an instruction manual and manufacturer's recommended logbook
- use oils for breathing air applications that are recommended by both the compressor and oil manufacturers

The air intake for the compressed breathing air system shall be situated and installed in accordance with manufacturer's specifications and designed to minimize the intake of contaminants. Atmospheric Monitoring of the work area may be required to ensure atmospheric contaminants are not drawn into the compressed breathing air system.

Breathing air couplings shall be incompatible with outlets for non-respirable worksite air or other gas systems.

Steel and aluminum SCBA cylinders and emergency escape pak cylinders shall be hydrostatically tested every 5 years by a Qualified service supplier. All other cylinders (e.g., carbon and fiberglass) shall be hydrostatically tested every 3 years by a Qualified service supplier. Each SCBA shall be functionally tested in accordance with the manufacturer's specifications.

Enbridge Employees may refer to the Filling Air Cylinders with Cascade System procedure in the OMM Book 3 to fill SCBA's and emergency escape packs.

Cylinders for hoseline breathing equipment shall be equipped with a pressure-reducing regulator to control hoseline pressure below 1380 kPa (200 psi).

Breathing Hoselines/Airlines shall:

- be appropriately rated for the maximum pressure produced in systems
- be protected from tangles, unnecessary wear and damage
- have fully-functional quick connectors at all times
- not exceed 76 m (250 ft.) in length

7.10 **Additional PPE Requirements**

Approved Personal Flotation Devices (PFD's) shall be worn when working within 3 m (10 ft.) of Open Water and have the ability to right a person who may be unconscious.

Additional PPE may be required for specific work. Refer to the work/task/job procedure and conduct a Hazard Assessment.

Workers shall wear appropriate clothing for body protection when performing job tasks as per the completed Hazard Assessment.

Appropriate chemical aprons (neoprene or nitrile) shall be worn when required by the SDS or the Hazard Assessment.

While performing electrical work, keep sleeves down and do not wear metal articles (e.g., rings, watches and key chains) unless the items are taped to make them non-conductive.

As determined by the Hazard Assessment, if there is a high potential for skin absorption of hydrocarbon products then approved Tyvek/rainwear shall be worn to prevent contamination. Protective creams may be considered for protection against skin irritation, burns or dermatitis.

8.0 Confined Space Entry Standard

Confined Space Entry occurs when Workers enter into an enclosed or partially enclosed area that meets all of the following criteria:

- is not designed or intended for continuous Worker occupancy (e.g., tanks, pipes),
- has restricted means of entry and exit that may compromise the provision of first aid, evacuation, rescue, or other emergency response (e.g., manholes, electrical vaults, boreholes, pits, sump tanks, vertical and horizontal culverts); and
- is large enough so that a Worker's entire body can enter the space

This applies to entry or work within Confined Spaces including, but not limited to:

- vaults
- culverts
- tanks (open-top or closed, underground, above ground, or in trucks)
- railway tank cars
- pressure vessels
- pits
- some parts of machinery
- ventilation systems
- access openings (manholes)
- pipes
- towers (heaters)

8.1 Responsibilities

Enbridge and Contractor management are responsible for ensuring the compliance with all Applicable Legislation and Enbridge requirements including, but not limited to:

- ensuring work is conducted in accordance with Confined Space Entry Permits and Hazard Assessments, and any procedures established as a result of this Standard
- ensuring a Qualified Confined Space Entry Supervisor is assigned for each confined space entry
- ensuring all Workers involved in Confined Space work have completed applicable Confined Space training
- ensuring compliance with the signage requirements for Confined Spaces
- maintaining a written inventory of existing and potential Confined Space Worksites at the Enbridge Locations they manage (e.g., at assigned Worksites; or for a Region)
- reviewing and updating the inventory of confined spaces at least once every 3 years, to verify accuracy
- ensuring confined space rescue plans are developed for typical Confined Spaces at the Enbridge Locations they manage
- ensuring all required documentation applicable to confined space entry is developed, completed and maintained, in accordance with Enbridge requirements and Applicable Legislation
- ensuring all resources (e.g., personnel, equipment, PPE) required for each Confined Space Entry are available

In addition, Enbridge management and Contractor management shall ensure a Hazard Assessment review is completed at least once every 3 years, in relation to Confined Spaces at Enbridge Locations under their management.

A Hazard Assessment review shall also be required (within the three-year period) if hazard conditions change or if new hazard information becomes known.

In all cases, the Hazard Assessment review shall evaluate the effectiveness of the Hazard Assessment process regarding the Confined Space and the suitability of established controls. The review of controls shall be based on relevant factors, such as:

- changes in workplace conditions or work activities
- workplace inspection reports
- injury statistics
- Incident investigations

In addition, Enbridge shall inform Contractors who are required to enter Confined Spaces about:

- Worksite specific Confined Space Entry requirements
- any specific identified hazards as well as experience with the space, such as knowledge of hazardous conditions
- precautions or procedures to be followed when in or near Confined Spaces

The Confined Space Entry Supervisor is responsible for:

- ensuring all Confined Space Entry and regulatory requirements are met prior to approving the Confined Space Entry Permit
- ensuring all Workers are Qualified to perform their their assigned tasks and roles
- knowing the hazards that may be faced during entry work, including information on the potential modes of exposure, plus the signs, symptoms and consequences of different exposures
- ensuring a Hazard Assessment is completed prior to entry and reviewing the Hazard Assessment with the Workers
- conducting and overseeing the work in accordance with the Pre-Job Entry Meeting
- ensuring Workers follow the requirements set out during the Pre-Job Entry Meeting
- ensuring adequate steps have been taken to eliminate and/or control all present or potential hazards, including isolation of equipment using the LOTO process
- verifying hazard controls are implemented and effective
- ensuring all required Atmospheric Monitoring and testing has been completed as required and is properly documented
- ensuring that all PPE/RPE and rescue equipment is inspected by a Qualified Worker and is in good working order before use
- ensuring that no Worker enters or remains in a Confined Space unless an effective rescue can be carried out
- ensuring that rescue services are available
- ensuring a suitable means of communication among Workers is established, in accordance with the Pre-Job Entry Meeting and Hazard Assessment

- supporting the Confined Space Attendant in controlling access to the confined space
- verifying safe entry and exit points are available to Workers and rescue Workers prior to their entry into the Confined Space
- ensuring that acceptable conditions are maintained for the duration of the entry work and that any requirements or status changes are communicated to the next Confined Space Entry Supervisor
- accounting for all personnel and equipment when the entry work is terminated

In addition, the Confined Space Entry Supervisor shall ensure the Confined Space Entry Permit is completed and reviewed with affected Workers.

Before approving the Confined Space Entry Permit and allowing entry to begin, the Confined Space Entry Supervisor shall ensure:

- all procedures specified by the Confined Space Entry Permit and the Hazard Assessment are readily available to Workers
- all equipment specified by the Confined Space Entry Permit and the Hazard Assessment is readily available and in place

Each Worker entering a Confined Space is responsible for:

- attending and completing training as required by this Standard
- applying the training to their work, i.e., to perform their assigned tasks and duties properly and in a safe manner
- immediately notifying the Confined Space Entry Supervisor when they do not feel Qualified to perform a task or assigned duty
- conducting work as directed by the Confined Space Entry Supervisor, and in accordance with Enbridge requirements, including this Standard, plus Confined Space Entry Permits and Hazard Assessments
- attending and participating in the Pre-Job entry meeting in accordance with section 8.11
- knowing the hazards that may be faced during entry and alerting the Confined Space Entry Supervisor when a hazard has not been adequately controlled
- being able to recognize in co-workers the signs and symptoms of illnesses or injuries due to hazardous exposures
- maintaining communication with the Confined Space Attendant and immediately notifying the attendant if an emergency or a hazardous, prohibited or unacceptable condition requires evacuation of the Confined Space
- exiting the space as quickly as possible when any of the following occurs:
    - the Confined Space Attendant gives the order to evacuate the space
    - an emergency
    - a hazardous, prohibited or unacceptable condition is detected
    - an evacuation alarm is activated
- properly using equipment
- wearing/using the required equipment (e.g., PPE, RPE, rescue equipment) properly, in a safe manner and at all times
- knowing the limitations of equipment used to control hazards related to Confined Space Entry work

- signing in and signing out of the confined space with the Confined Space Attendant

A Worker designated as a Confined Space Attendant shall first be Qualified in accordance with the applicable training matrix.

The Confined Space Attendant is responsible for:

- ensuring they have the necessary training and certifications to allow for their designation by a Confined Space Entry Supervisor as the Attendant for an entry
- wearing appropriate clothing (e.g., vest) or other means of identification as the Confined Space Attendant (in accordance with Applicable Legislation and/or the particular requirements for that Worksite)
- attending and participating in the Confined Space Pre-Job Entry Meeting in accordance with section 8.11
- reviewing the entry and rescue procedures, being aware of all Confined Space Entry Permit and Hazard Assessment requirements and ensuring all requirements are followed
- being aware of the hazards faced by Workers during entry work, including information on the signs and symptoms of different exposures, and the possible behavioral or other effects of different exposures
- ensuring they have an effective means of constant communication with the Workers entering the Confined Space, the emergency rescue services and the Confined Space Entry Supervisor at all times
- ensuring initial and ongoing air testing occurs, as required, and recording the test results on the Confined Space Entry Permit
- ensuring entry points are kept clean and clear
- controlling access to the Confined Space and prohibiting entry to unauthorized Workers
- tracking and recording, on the Confined Space Entry Permit, all personnel entering and exiting a confined space, and controlling the number of Workers within the space as required by the Confined Space Entry Permit
- being aware of hazardous, prohibited or unacceptable conditions that require evacuation of the space
- being prepared to initiate evacuation from the space, as necessary, due to actual or potential hazards (this could include hazards within the space and also in the vicinity of the space that could affect the health and safety of Workers)
- ensuring the space has been completely evacuated in the event of an emergency
- requesting rescue and other emergency services when necessary, e.g., as soon as it is determined that Workers in a Confined Space may need assistance to evacuate; or, if a situation arises outside the Confined Space that could endanger the Workers inside or near the Confined Space

Additional requirements include:

- a Confined Space Attendant shall not enter a Confined Space for any reason and shall never leave the entrance to a Confined Space, unless relieved by another designated and Qualified Confined Space Attendant

- if relieved of their Confined Space Attendant responsibility, the original attendant may enter the space to perform rescue operations, if Qualified for rescue work, and only in accordance with the rescue procedure for that Confined Space
- a Confined Space Attendant shall not perform other duties which might interfere with their primary duty to monitor and protect the authorized Workers working in the space, unless they are performing non-entry rescue in accordance with the rescue procedure
- prior to leaving the entrance of a Confined Space, the Confined Space Attendant shall verify that no person is inside the Confined Space before it is closed off, and shall ensure proper signage/barricades are in place to prevent unauthorized entry into the Confined Space

The Confined Space Entry Permit approver is responsible for:

- acknowledging the work
- reviewing hazards and controls with the Permit Issuer
- ensuring the Confined Space Entry Permit Issuer is aware of site-specific information

The Confined Space Entry Permit Issuer is responsible for:

- reviewing hazards and controls with the Permit Receiver
- verifying compliance with the requirements on the Confined Space Entry Permit
- verifying that appropriate controls are in place
- ensuring Atmospheric Monitoring is complete
- classifying the space as per the initial Atmospheric Monitoring and identified hazards
- determining the need for a Confined Space Attendant

The Confined Space Entry Permit receiver is responsible for:

- providing the Permit Issuer with adequate notice
- providing a sufficient description of the scope of work
- reviewing hazards and controls with Workers involved in the work
- ensuring requirements on the permit are followed

8.2 **Training and Qualification**

Before entry or work within a Confined Space, the Confined Space Entry Supervisor and all Workers with assigned duties related to the work shall be trained and Qualified in their specific role of the Confined Space Entry, including:

- hazard identification and assessment for Confined Spaces
- required procedures, as set out in this Standard
- selection and use of required PPE, including RPE
- Atmospheric Monitoring and sampling
- Confined Space Attendant requirements
- correct use of fire extinguishers when Hot Work is involved

Workers who are assigned emergency rescue duties shall also be trained in the following:

- first aid and cardio-pulmonary resuscitation
- Confined Space rescue and equipment training

Confined Space Entry to Class 1, 2, or 3 spaces is prohibited by any person who doesn't have Confined Space training.

8.3 Confined Space Classes

All Confined Spaces shall be designated as Class 3 until results of initial Atmospheric Monitoring are determined. Based on the results, a space may then be newly designated as Class 1, 2, or 3. Initial Atmospheric Monitoring may require Workers doing the testing to use SAR/SABA or SCBA, if the space cannot be adequately tested from outside the space.

Class 1 (Low Atmospheric Hazard)

Class 1 Confined Spaces are those where airborne concentrations within the following limits are verified by initial testing and are unlikely to change:

- oxygen: 19.5 to 23.5% [USA] or 19.5 to 23% [CAN]
- lower explosive limit (LEL): less than (<) 3%
- hydrogen sulfide (H_2S): less than or equal to (≤) 10 ppm
- carbon monoxide (CO): Less than (<) 25ppm
- benzene: 0 ppm to 0.5ppm
- other toxic contaminants: less than or equal to (≤) Exposure Limits
- RPE is not required

Class 2 (Moderate Atmospheric Hazard)

Class 2 Confined Spaces are those where airborne concentrations within the following limits are verified by initial testing or have the potential to develop due to atmospheric change, temperature change or type of work:

- oxygen: 19.5 to 23.5% [USA] or 19.5 to 23% [CAN]
- lower explosive limit (LEL): 3% to less than (<) 10 %
- hydrogen sulfide (H_2S): less than or equal to (≤) 10 ppm
- carbon monoxide (CO): Less than (<) 25ppm
- benzene: 0.6 ppm to 5 ppm
- RPE: half-mask APR with appropriate cartridge; refer to PPE Standard
- other toxic contaminants: greater than (>) Exposure Limits but less than (<) 10 times the Exposure Limit

Class 3 (Severe Atmospheric Hazard)

Class 3 Confined Spaces are those where airborne concentrations within the following limits are verified by initial testing, or are likely to develop or when the atmospheric concentrations cannot be verified:

- oxygen: less than (<) 19.5 or greater than (>) 23.5% [USA] or 23% [CAN]
- lower explosive limit (LEL): 10% to less than (<) 20%
- hydrogen sulfide (H_2S): greater than (>) 10 ppm
- carbon monoxide (CO): Greater than or equal to (≥) 25ppm
- benzene: 6 ppm to less than (<) 500 ppm
- other toxic contaminants: greater than (>) 10 times the Exposure Limit
- RPE: SAR/SABA or SCBA; refer to PPE Standard

A person shall not enter or work in or near a Confined Space if the LEL is greater than (>) 20%.

Non-Permit Confined Space

A Non-Permit Confined Space (also known as restricted spaces in some jurisdictions) does not contain hazardous atmospheres or have the potential to contain any hazardous condition that may cause death or serious physical harm.

A space may be classified as a Non-Permit Confined Space provided that all hazards within the space are eliminated and verified without entry into the space and remain eliminated for the duration of the entry Note: control of atmospheric hazards through forced air ventilation is not considered elimination of the hazards.

The basis for determining that all hazards in the space have been eliminated is documented on:

- Parts 1, 4, 5 and 6 of the Confined Space Entry Permit; and
- The Safe Work Permit

A rescue plan shall be established for each Non-Permit Confined Space. The plan shall include requirements related to communications and working alone.

If a hazard arises or occurs within a Non-Permit Confined Space, each Worker in the space shall exit the space. The space shall then be reassessed to determine if it shall be re-designated as a Class 1, 2 or 3 Confined Space.

8.4 Work Practices

Hot Work is not permitted in Confined Spaces where:

- the LEL is greater than (>) 10%
- the oxygen content is greater than (>) 23% [CAN] or 23.5% [USA]

If these conditions are exceeded during Hot Work activities, the Hot Work shall stop and remain stopped until the conditions are deemed safe for work to continue. This determination shall be based on additional or subsequent air testing.

If it is not reasonably practicable to eliminate a hazardous (e.g., explosive or flammable) atmosphere within the Confined Space through another means, the Confined Space shall be inerted.

Inerted refers to removing oxygen from a Confined Space and replacing it with an inert gas such as nitrogen, carbon dioxide or argon to remove the hazard of fire or explosion.

Inerted Confined Spaces are classified as Class 3 due to the removal of oxygen (oxygen deficient atmosphere). Class 3 Confined Spaces require the use of SCBA.

8.5 Confined Space Entry Permit

A Worker shall not enter a Confined Space without a valid Confined Space Entry Permit. The permit shall be:

- approved by the Regional Director/Manager (or designate) or the Project Director (or designate) for work within Class 3 Confined Spaces or approved by the Site Supervisor for all other work
- signed by both the Permit Issuer and the Permit Receiver

The Confined Space Entry Permit is verification that a Hazard Assessment has been completed. Do not issue any Confined Space Entry Permit until:

- the scope of work has been:
    - defined in sufficient detail to ensure all hazards are identified and controlled
    - reviewed with the Permit Issuer for accuracy
- all potential hazards and controls have been identified

If the Permit Receiver or Permit Issuer changes while the work is in progress, the new Permit Receiver or Permit Issuer shall read and sign the Confined Space Entry Permit to acknowledge the conditions under which the permit was issued.

Changes to the original permit may be noted on copies of the original.

Confined Space Entry Permits are valid for a maximum of 12 hours or until the end of the shift in which the permit was written. When a shift change occurs, a new permit shall be written and reviewed before resuming work activities.

Any Site emergency shall force the stoppage of all work and thus shall require all Confined Space Entry Permits to be re-written or re-authorized before work can continue. A Confined Space Entry Permit may be extended past the 12-hour period as long as:

- the same Worker is involved in the work
- the extension is identified and authorized on the Confined Space permit
- a review of the Confined Space permit indicates it is still valid

Confined Space Entry Permits (and applicable records) shall be maintained as follows:

- Permit Receiver (white copy)
- Permit Issuer (pink copy)
- information board (yellow copy)

The white copy of the permit (applicable records) shall be readily available from the Confined Space Attendant, at or near the entrance of the Confined Space. When work is complete each day, the Permit Receiver shall return the white copy of the permit (and applicable records) to the Permit Issuer. The Permit Issuer shall retain the white copy of the permit (and applicable records) onsite.

8.6 **Confined Space Hazard Assessment**

The Confined Space Entry Supervisor shall ensure a Qualified Worker completes an adequate assessment of the hazards related to each Confined Space before any Worker enters the Confined Space.

The Qualified Worker is responsible for:

- identifying and assessing existing and potential hazards:
    - specific to the work activity and related job tasks
    - that may exist due to the design, construction, location, use or contents of the Confined Space
    - that may develop while work is done inside the Confined Space
- identifying controls for existing and/or potential hazards
- ensuring the controls eliminate the hazard or reduce the risk or hazard to as low as reasonably achievable (ALARA)

- specifying and performing the type and frequency of inspections and tests necessary to determine the potential for Worker exposure to any of the identified hazards
- where reasonably practicable, involving all Workers associated with the work in the Hazard Assessment
- communicating the results of the Hazard Assessment to all Workers affected
- documenting the Hazard Assessment on the Confined Space Entry Permit as verification
- dating and signing the Hazard Assessment

If two or more Confined Spaces are of similar construction and present the same hazards, their assessments may be recorded in a single document, but each Confined Space shall be clearly identified in the assessment.

8.7 Isolation Requirements

Each Worker entering a Confined Space shall be adequately protected against isolation related hazards, as follows:

- release of hazardous substances into the Confined Space: protect Workers by disconnecting, blanking, blinding or double block and bleed of piping
- contact with electrical energy inside the Confined Space: protect Workers by disconnecting, de-energizing, locking out and tagging the source of electrical energy
- contact with moving parts of equipment inside the Confined Space: protect Workers by disconnecting the equipment from its power source, de-energizing the equipment, locking it out and tagging it

Isolate according to the requirements in Standard 18, Control of Hazardous Energy.

Other adequate means of Worker protection and hazard prevention are required if the above controls are not possible in each of these situations.

As identified and required by the Hazard Assessment, Workers shall also be adequately protected against drowning, engulfment, entrapment, suffocation, and other hazards from free-flowing material.

8.8 Ventilation Requirements

If atmospheric hazards exist or are likely to exist in a Confined Space, the Confined Space shall be purged or ventilated, or both, before any Worker enters the space.

Acceptable atmospheric levels shall be maintained at all times when one or more Workers are present in a Confined Space,

Ventilation requirements shall be documented on the Hazard Assessment.

If testing indicates that the Confined Space’s atmosphere is explosive, or if assessment determines that an explosive atmosphere is likely to develop, then purging of the space with an inert gas shall be performed prior to ventilation.

Using air movers as a means of ventilation may create a hazardous, explosive atmosphere, due to the addition of oxygen into the Confined Space.

If ventilation and/or purging are not practical to maintain acceptable atmospheric levels in a Confined Space, the Workers involved shall wear RPE in accordance

with Class 2 or Class 3 requirements, depending on the classification assigned to the space.

If mechanical ventilation is required to maintain a safe atmosphere in a Confined Space, the ventilation equipment shall be equipped with an alarm that will be activated automatically if the equipment fails.

An adequate warning system of ventilation failure shall be in place, to ensure each Worker receives each warning and is able to exit the Confined Space safely.

The mechanical ventilation equipment shall be audible or visible to every Worker in the Confined Space, or monitored by a Worker who is in constant attendance at the equipment and who is in communication with the Workers in the Confined Space. Should the ventilation equipment fail to operate properly, this Worker shall immediately direct Workers in the Confined Space to evacuate.

Air volume for Confined Spaces should meet the following criteria, if applicable:

- minimum volume of 1.9 m^3/s of air passes through the active working zone
- air in the Confined Space contains at least 19.5% oxygen by volume
- the Confined Space has an air exchange rate of at least 8 times/hour
- the concentration of each hazardous substance or contaminant(s) present in the space's atmosphere is below all Exposure Limits

Proper set-up of a ventilation system for a Confined Space is critical to ensure its effectiveness and to minimize/control hazards and exposures. Consider the following:

- Eliminate "short-circuiting" of airflow around the fans or blowers by using an adaptor plate to bolt the fan to the flange of a man-way, or use any other safely feasible measure.
- Supply air needs to be ducted/hosed to deliver it to the work zone and exhaust air needs to be able to capture any contaminants that may be generated by work activities. The exhaust hood or duct should be placed 300 mm (1 ft.) from the source of the contaminant(s).
- A combination of pushing air in and pulling air out of the Confined Space is often the most effective. If a contaminant is heavier than air (e.g., crude oil vapors), the ventilation strategy should be to push air in from the top and channel exhaust air out from the bottom. However, if the contaminant is lighter than air (e.g., methane), the contaminant has a tendency to rise to the top of the space; thus, the ventilation strategy should be to push air in from the bottom and pull air out from the top.
- Ventilation should be continuous, where possible, if the source(s) of the hazardous atmosphere still exists, or if operations in the Confined Space generate contaminants or hazards that create a hazardous atmosphere.
- When a Confined Space has only a single man-way or opening, or has interior obstructions that decrease the effectiveness of dilution ventilation; local exhaust ventilation with a capture hood/duct placed at the source of contaminants is recommended.
- Confined Spaces containing flammable gases or vapors may need to be purged with an inert gas prior to ventilating with air. If inert gases (e.g. nitrogen, argon, carbon dioxide) are used for inerting the Confined Space, the space shall be well-ventilated after the inerting is completed. Then the atmosphere shall be re-tested before any Worker enters the space.
- Where flammable or combustible gases may be present, the ventilation equipment used shall be designed for use in such environments. The

equipment shall also be properly grounded and bonded to prevent static electricity from potentially igniting a combustible source.

- Ensure the make-up (fresh) air for the Confined Space is free of contaminants. Note that make-up air could be contaminated by:
    - exhaust air that carries contaminants from work that is carried out within the Confined Space
    - exhaust from nearby or adjacent fuel-operated equipment, such as generators, air compressors, vacuum trucks, or other vehicles
    - vapors or substances arising from nearby or adjacent operations and processes, e.g., organic vapors from painting, silica from blasting operations, or lead from paint removal work

8.9 **Atmospheric Monitoring and Sampling**

Refer to section 11.2 Portable Atmospheric Monitoring and Sampling and section 14.6 Respiratory Hazards for additional information on Confined Space Atmospheric Monitoring and Sampling.

Atmospheric Monitoring for hazards shall:

- be conducted by a Qualified person using calibrated test instruments that are appropriate for the atmosphere being tested and used in accordance with manufacturers' specifications
- be completed in accordance with the requirements identified on the Hazard Assessment
- be performed in a manner that does not endanger the health or safety of the Worker performing the test
- be performed in the following order:
    1. oxygen content (% O_2)
    2. flammable gases/vapors (% LEL)
    3. toxic air contaminants (e.g., H_2S)
    4. other toxic contaminants associated with the work activity and related job tasks (e.g., CO)
- be performed before a Worker enters a Confined Space, and before a Worker re-enters a Confined Space that has been unoccupied for any length of time
- be used to determine the Class (1, 2, 3 or Non-Permit) of the Confined Space

Remote gas detector accessories (e.g., sample draw pumps) may be needed for Atmospheric Monitoring at various locations or elevations.

Before entry into a Confined Space, conduct initial Atmospheric Monitoring through openings from outside the Confined Space, where possible. Use a calibrated direct-reading and/or grab sample instrument.

If testing from outside the Confined Space is not possible, conduct initial Atmospheric Monitoring from inside the Confined Space using PPE/RPE, in accordance Standard 7 PPE in this manual. Confined Spaces are considered Class 3 until Atmospheric Monitoring is complete.

Continuous Atmospheric Monitoring for the following is required anytime a Worker is inside a Confined Space:

- oxygen (O_2),
- lower explosive limits (LEL)
- hydrogen sulfide (H_2S)
- carbon monoxide (CO)

Periodic Atmospheric Monitoring and Atmospheric Sampling may be required for other hazards or contaminants (e.g., benzene). These frequencies shall be documented on the Confined Space Entry Permit.

If Atmospheric Monitoring indicates the Class of the Confined Space has changed or new hazards are present:

- the work shall stop
- all Workers shall evacuate the Confined Space, and
- the Hazard Assessment shall be reviewed and updated as required

If the source of the changed or new hazard is unknown, an investigation shall be required before re-entry into the Confined Space is permitted.

Initial Atmospheric Monitoring results shall be recorded on the Confined Space Entry Permit, and then at adequate intervals, as identified and required by the permit.

The record of Atmospheric Monitoring results shall include the following:

- tester signature
- test date
- test equipment used
- test methods used
- test results

8.10 Confined Space Procedure Requirements

Written safe work procedures shall be developed for each Confined Space or similar Confined Space prior to entry into the Confined Space. In addition, a written rescue plan shall also be developed (see 8.12).

For Enbridge Facilities, the Contractor's Confined Space procedures shall be reviewed by a qualified Enbridge Representative prior to Confined Space work.

Confined Space procedures shall be attached to the Confined Space Entry Permit and reviewed with Workers affected during the Pre-Job Entry Meeting.

The Confined Space procedures shall establish a constant means of communication (e.g., voice, visual, signal line) between the Confined Space Attendant and:

- Workers entering the Confined Space
- backup Workers or rescue personnel
- the Confined Space Entry Supervisor

The means of communication shall be:

- suitable for the hazards identified during the Hazard Assessment
- maintained as long as Workers are in the Confined Space

The Confined Space entry procedures shall also require that a Confined Space Attendant:

- is positioned at or near the entrance of Class 1, 2 and 3 Confined Spaces
- is provided with the following:
    - an emergency warning system or procedure as determined by the Hazard Assessment
    - a fire extinguisher for Hot Work
    - required PPE, including high-visibility vest, RPE for the Class of Confined Space, and Fall Protection equipment
- is trained on the following topics:
    - access/egress
    - emergency/evacuation procedures
    - use of fire extinguishers
    - use of PPE and RPE

8.11 **Pre-Job Entry Meeting**

Before starting work, the Confined Space Entry Supervisor shall conduct a Pre-Job Entry Meeting with all involved Workers to review the following:

- the Confined Space Entry Permit
- the Hazard Assessment
- established procedures (e.g., safe work, emergency/rescue)
- air testing results and frequency of testing
- method of recording testing results (e.g., Worker inside the space relays results to the Confined Space Attendant)
- communication systems to be used (e.g., constant communications/methods
- isolation of energy sources and control of materials movement
- required PPE and RPE
- securing the Confined Space from unauthorized entry
- emergency equipment and required inspection of the equipment
- ventilation requirements

The Confined Space Entry Supervisor shall document and sign the Pre-Job Entry Meeting section on the back of the Confined Space Entry Permit (Part 7). This signature authorizes entry into the Confined Space. The Confined Space Entry Supervisor shall also ensure all Workers involved sign under this section.

Involved or affected Workers include, but are not limited to, the following:

- Workers entering the Confined Space,
- Confined Space Attendant
- atmospheric testers
- onsite designated rescue personnel

8.12 **On-Site Evacuation and Rescue**

A Worker shall not enter a Class 1, 2 or 3 Confined Space or a Non-Permit Required Confined Space unless a detailed, written rescue plan is:

- developed and readily available
- reviewed at the Pre-Job Entry Meeting prior to entry into the Confined Space

- ready for immediate implementation to ensure an effective evacuation and rescue can be carried out in the event of an emergency

Rescue plans shall be retained with the Confined Space Entry Permit and should be reviewed periodically and practiced regularly.

The written rescue plan specific to a Confined Space shall include, but is not limited to, the following:

- Confined Space Attendant name(s)
- rescue personnel/services to be used
- location and dimensions of the Confined Space
- location of entry and exit points and obstacles to removing an injured Worker (note: the use of plans, drawings or sketches is helpful)
- required training for Workers involved in rescue procedures, including rescue training and related training such as first aid and CPR
- rescue equipment and location of the equipment (note: for Class 2 and 3 Confined Spaces, the required rescue equipment shall be located at the Confined Space entrance)
- the means of constant communication used to notify involved Workers and responders of an emergency situation
- evacuation methods and signals, e.g., establishment of a meeting point; use of horns or alarms
- method of rescue that is to be used for that particular space, taking into account the work tasks being performed in the Confined Space, and the potential rescue scenarios
- number of Workers (minimum and maximum) involved in the Confined Space entry work

If possible, the rescue plan should include options for non-entry rescue, including retrieval systems or methods that can be used whenever a Worker enters a Confined Space. A non-entry retrieval option should be used unless the retrieval equipment being used would increase the overall risk of entry or would not contribute to the rescue of a Worker inside the Confined Space.

Rescue personnel shall be provided with all equipment necessary to perform an effective rescue in accordance with the rescue plan for the Confined Space.

All rescue attempts shall be made by trained Workers with the proper equipment (the majority of Confined Space fatalities are rescuers).

Non-Enbridge Rescue Services

If off-site, third-party rescue services are required or used (e.g., fire department), the Confined Space Entry Supervisor (or a designated Enbridge Representative) shall contact the rescue service and jointly develop a rescue plan prior to entry.

The Rescue Plan shall:

- ensure all parties understand the rescue capabilities and limitations of the rescue service before any rescue service personnel enters the Confined Space
- ensure that the rescue service supervisory personnel are trained in Confined Space entry and informed and aware of all hazards associated with entry to the Worksite and specific Confined Spaces

8.13 **Top-Entry Confined Spaces**

If entrance into a Confined Space is from the top, the following requirements shall be met:

- each Worker entering the space shall use a full-body harness and, where appropriate, be attached to a lifeline
- if a lifeline is used, the lifeline shall be attended by another Worker who is Qualified to carry out the established rescue procedures
- where reasonably practicable, a mechanical lifting device shall be located at the entry to the Confined Space and available for use during a rescue; the device shall be placed at the entrance at all times when one or more Workers are in the Confined Space

If the use of a full-body harness or lifeline could create an additional hazard, an alternate method of rescue shall be developed and implemented.

8.14 **Confined Space Signage**

Confined Spaces that are permanent, or that are frequently accessed, shall be identified by signage stating “Danger, Confined Space – Entry Permit Required” or a sign using similar language.

9.0 Injury Prevention Standard

9.1 Injury Prevention

Rebar, T-bar and other impalement hazards shall be capped or otherwise protected.

Blocks shall be used to prevent equipment from rolling and heavy parts from falling. Check with fellow Workers before removing blocks.

Overhead ice buildup should be removed as soon as it starts to occur, to prevent the formation of a large mass that could potentially injure Workers, or damage equipment. The removal method shall be determined based on the hazards.

9.2 Traction and Slipping

Workers shall take all appropriate measures to prevent slipping hazards in all work areas and walkways.

Such measures or controls may include the application of sand or other approved materials that provide grip and traction.

In addition, all work areas and walkways shall be visually identifiable through signage, flagging, or other methods appropriate for the work and weather conditions.

At all times, work areas and walkways shall be maintained to minimize the risk of slips or falls, including:

- covering of holes and openings
- good housekeeping
- removal or repair of uneven walking surfaces, e.g., repair of uneven floor boards
- removal of unnecessary objects or equipment

Work areas and walkways shall be kept clear of snow and ice. As appropriate, use authorized traction control aids, such as sand, gravel or an approved snow melt.

When weather conditions (such as snow, fog or rain) may contribute to or increase hazards (e.g., by obscuring a hazard), Workers shall identify the hazardous areas, e.g., with flagging, marking or other appropriate means.

Where use of a traction control aid is not authorized or appropriate, Workers, in consultation with the Site Supervisor, shall identify alternative means of reducing, eliminating or controlling the hazard, such as traction aids or grated walking surfaces.

Be aware of the potential for different hazards related to ice and/or snow. For instance, ice build-up or slippery conditions may be present under snow cover. Other hazards may also be present or hidden under ice or snow.

Workers shall not walk or stand on exposed pipes.

9.3 Line of Fire and Pinch Points

Line of fire is when a Worker may be at risk of injury from a hazard, such as:

- Hazards associated with working equipment or machinery
- release of spray
- falling objects

Generally, Workers may be in the line of fire at any work location where equipment or machinery is transmitting energy (e.g., in movement).

Pinch points also represent an injury risk. A pinch point Incident is when any part of a Worker's body gets caught between two other objects. For instance, a Worker's leg may get pinched against a wall between a forklift load and the wall.

Methods of guarding shall be provided to protect Workers from pinch point injuries. Specific pinch point hazards shall be identified on the Hazard Assessment. Based on the potential and existing pinch point hazards, additional specific PPE may be required to protect Worker from line of fire and pinch points. More information on machine guarding can be found in section 20.5.

Wrap points are the exposed, rotating components on machinery or equipment. Wrap points present a potential hazard to Workers, as different items can be caught up or entangled in a wrap point. Such items may include a Worker's clothing, hair or jewelry.

A combination of controls shall be used near wrap points, including guarding. Workers shall not wear loose-fitting garments or jewelry. Workers with long hair shall keep their hair tied back, to avoid entanglement.

Shear points are formed when two edges come close enough together to cut what is between them. Cutting points are found where an edge is moved fast and forcefully enough to cut material. Shear points and cut points shall be guarded in a manner that encloses the points within the machinery or equipment, or shall otherwise be guarded to prevent the operator from being exposed to the hazard.

In addition to effective (engineered) guarding and using the right PPE for the work, administrative controls shall also be used, including Worker training and safe work practices.

Evaluating pinch points and line of fire:

- Hand placement:
    - Never place your hand, fingers or any other body part in the line of fire. Always use push sticks, guards, shields, or other devices as appropriate to avoid putting your fingers in pinch points.
- Equipment or loads that swing:
    - Don't try to stop the swing unless you have the proper tool to do so. Never use your hands.
- Doorways:
    - Consider hand placement when going through doors. Never handle objects by the sides that will potentially hit the door or contact the door-jamb.
- Automated equipment:
    - Be alert when working around automated equipment, including remote or motor operated valves. Relays, delay timers, and remote controllers can cause equipment to open, close or "startup" without warning. Never put your hands in the hazard area
- Moving heavy objects:
    - Be aware that losing control of something heavy can cause injury to hands. Don't try to catch the object, let it drop, and be aware of foot placement to avoid crushing injuries from dropped objects.

Refer to section 20.5 Equipment and Machine Guarding for more information on pinch point control requirements.

9.4 Industrial Hygiene

Enbridge's industrial hygiene program protects Workers from work-related illnesses and injuries. The program will anticipate, recognize, evaluate, and control the industrial hygiene hazards that Workers may be exposed to in the workplace. Worker exposure shall be assessed for all physical, chemical, and biological agents.

Exposures will be measured against Exposure Limits. An Exposure Limit is a Workplace standard below which is believed that nearly all normal and healthy Workers may be repeatedly exposed, day after day, for working lifetime without adverse health effects.

Exposure mitigation and control protocols will be utilized anytime a measured exposure is above an Action Level, where applicable. An Action Level is a threshold value, equal to or below the Exposure Limit, which initiates an exposure mitigating response action.

Worker exposure shall be determined, empirically or conceptually, prior to the start of new projects or job tasks. Periodic exposure surveillance may also be required for routine or continuous work practices.

9.5 Assessment and Prevention of Ergonomic Hazards

There are many different types of ergonomic hazards in the workplace.

For instance, in some cases, the risk of injury may be due to improper use of manual lifting techniques, and/or awkward or unsafe body positioning for the work. Other potential factors may include overexertion, overextension, repetitive motions, repetitive strain, or working too long in the same position or at the same task.

To recognize and control ergonomic hazards, use methods such as:

- Ergonomic Assessment
- Task Analysis
- Hazard Assessment
- Safe Work Permit

With effective use of Hazard Assessment methods, important factors and risk factors can be evaluated, such as:

- work dimensions
- spatial clearance
- vertical and horizontal distances
- force
- frequency
- postures
- repetition and task duration
- other physical stressors (e.g., vibration, temperature, illumination, humidityWhere there is a known risk of Musculoskeletal Injury (MSI) or a Repetitive Strain Injury (RSI) associated with a task or job function, a People Leader shall ensure an ergonomic assessment is completed, in consultation with the Corporate Health and Safety Department.

Musculoskeletal disorders include:

- tendon disorders – such as tendonitis, tenosynovitis, DeQuervain's disease, Ganglion and epicondylitis
- nerve disorders – such as carpel tunnel syndrome and Cubita tunnel syndrome
- back disorders – such as back sprain, back strain, degenerative disc diseases and herniated/ruptured/bulging discs

If a trend is identified by the Corporate Health & Safety Department where MSIs are experienced by Workers involved in a given task or job function, then the Corporate Health & Safety Department shall take steps to prevent or control the identified factors or hazards.

In consultation with the Health & Safety Department as needed, People Leaders shall also use methods such as safety observations and work practice inspections to help identify ergonomic hazards, and possible solutions or controls.

Early Identification of Ergonomic Risk Factors

During the design phase for a Project or Facility, Enbridge management should ensure ergonomic risk factors are identified and evaluated, and develop recommendations to mitigate potential impacts.

Examples of factors that should be evaluated include processes, tools, equipment, layouts, workstations and Facilities. For such factors, the relevant ergonomic design guidelines should be consulted.

For instance, the ergonomic features of power tools should be evaluated before purchase. Similarly, chairs and workstations (e.g., desks, equipment) should also be evaluated prior to purchase, to ensure they meet applicable ergonomic Standards or specifications.

Manual Lifting

Proper methods of manually lifting and handling materials protect Workers from injury. When equipment is available and conditions make it practical, use mechanical devices for lifting and carrying. Cranes, hoists, pickers, lift trucks, and similar units are made for this purpose.

Before lifting a load, Workers shall assess the hazards and injury risks.

Hazard Assessment steps should consider factors and conditions, such as:

- frequency of lifting – e.g., does the work involve only a few lifts, several hours of lifting, or more?
- lifting motions and positions – e.g., is there a risk of strain or injury if lifting above shoulder height and twisting while lifting?
- grip and handling – e.g., are Workers provided with proper gloves or equipment to handle each lift; are the materials slippery to handle?
- safe footing – e.g., are controls in place to prevent slippery walking surfaces in the work area?
- stability of objects or loads – e.g., are loads or stacked items in a stable position before and during the lifting work?
- weight of the load – ensure individual Workers do not lift loads more than 50 lbs (23 kg)

- visibility factors – take measures to ensure each Worker's vision is not blocked by the load or object being lifted, or by other nearby Workers, material or equipment

If a lifting task involves one or more risk factors or conditions, such as those listed above, request assistance from one or more Workers, as appropriate, or use mechanical lifting equipment.

If using mechanical equipment, request assistance from another Worker as appropriate, e.g., to assist with sightlines, guide the load or other assistance to ensure the lifting work is completed safely.

When lifting use the following controls:

- Plan the lift and test the load. Before lifting, think about the item being moved and assess:
    - can that be done alone
    - is it too awkward for one person
    - is the path clear
    - what is the approximate weight before lifting
- Ask for help. If the load is too heavy or awkward to lift, ask for assistance
- Get a firm footing. Keep your feet apart for stability and point your toes out
- Bend your knees. Do not bend at the waist. Keep the principles of leverage in mind at all times
- Tighten your stomach muscles. Use intra-abdominal pressure to support your spine when you lift, offsetting the force of the load. Train your muscles to work together.
- Lift with your legs. Let your leg muscles do the work of lifting. Do not rely on your weaker back muscles
- Keep the load close. Do not hold the load away from your body. The closer it is to your spine, the less force it exerts on your back
- Keep your back upright. Whether lifting or putting down the load, do not add the weight of your body to the load. Avoid twisting

A hierarchy of intervention methods is presented below in the order of priority. In situations with multiple causal factors, a combination of control methods may be warranted.

- 1. Process Elimination – means elimination of non-value added processes, job tasks, motion, transportation and uncomfortable layouts. Elimination may be achieved by design/redesign, modifications or different approaches, e.g., lifting down sample cans from workstations and lifting them up to the trucks may be eliminated by using a cart.
- 2. Substitution – means substituting a new work process or tool without ergonomic hazards for a work process with identified ergonomic hazards. Substitution serves to eliminate the hazard. For example, hand tools that require awkward wrist positions such as extreme wrist flexion, extension or deviation can be replaced with tools that allow a neutral wrist posture.
- 3. Engineering Controls – changes are made to the workstations, tools and/or machinery that alter the physical composition of the human-machine interface or process so that the ergonomic risk factors are eliminated or reduced
- 4. Work Practice Controls – means procedures or practices are used to reduce Worker exposure to Work-related Musculoskeletal Disorder risk factors such as:

  - using proper posture and proper lifting techniques for bulky objects
  - selecting and using proper tools and workstations
  - allowing a conditioning or break-in period for new and returning employees
  - regularly monitoring and observing Worker practices, and correcting practices to reduce risk
- 5. Administrative controls – means controls used to limit the duration, frequency and severity of exposure to work-related musculoskeletal hazards. Examples of administrative controls include, but are not limited to: providing rest breaks, doing stretching exercises, providing opportunities for job enrichment, limiting overtime work and instituting job rotation.
- 6. Personal Protective Equipment (PPE) – PPE may be used as an interim measure to control work-related musculoskeletal hazards, but must not be used as a permanent control when other controls are feasible. Some factors to consider include:
  - ergonomic-related PPE such as wrist rests, back belts and back braces have not demonstrated their effectiveness in preventing work-related musculoskeletal disorders
  - anti-vibration gloves have proven to be somewhat effective in reducing vibration hazards
  - PPE should not contribute to work-related musculoskeletal disorder hazards and increase safety risks
  - PPE used for the purpose of preventing or reducing ergonomic hazards shall be approved by Health & Safety or recommended/prescribed by a licensed health care professional

10.0 First Aid and Bloodborne Pathogens Standard

10.1 Program Requirements

This Standard applies to any Worker who provides first aid or medical assistance where there is a potential risk of infection, illness or injury, due to exposure to body fluids, Blood, Bloodborne Pathogens and/or Other Potentially Infectious Material (OPIM). Refer to these defined terms.

Depending on a Worker's job, assigned duties, and/or level of first aid training, a Worker may at times be in a position to provide first aid or medical assistance.

Note, in most instances, Workers who are specifically trained or Qualified to provide first aid and/or emergency response will respond to Incidents or events where first aid or medical assistance is required. (Also refer to 11.1, First Aid Equipment.).

Use engineering controls and work practice controls to eliminate or minimize employee exposure to bloodborne pathogens in the workplace. Where the potential for exposure remains after an incident, the following controls must be implemented, including the use of PPE.

One of the main infection hazards for Workers is exposure to sharps (e.g., used needles). To help prevent exposures to sharps and reduce the risk of sharps injuries, Enbridge Locations shall have specific containers for safe disposal of sharps.

The following precautions shall be taken when handling sharps:

- a sharps container shall have a clearly defined maximum capacity (i.e., have a fill line that indicates when the container is ¾ full) and shall be sturdy enough to resist punctures under normal conditions of use and handling
- a person shall not re-cap a used needle
- each used needle shall be safely disposed of in a sharps container
- sharps containers shall be emptied when they become ¾ full ,so that the containers can be disposed of properly

Any Worker who is potentially exposed to Bloodborne Pathogens while on the job shall immediately receive a confidential medical evaluation.

10.2 Controls

Enbridge shall provide hand washing facilities readily accessible to Workers who may be potentially exposed while providing first aid or medical assistance; if washing facilities are not provided, antiseptic cleansers shall be provided.

To prevent potential exposure to body fluids, Blood, Bloodborne Pathogens and OPIM, Workers involved in providing first aid or medical assistance shall:

- wear appropriate PPE, which includes eye and face protection, hand protection and protective clothing (i.e., coats, gowns or jackets)
- wear disposable latex gloves when hand contact with blood, body fluids or OPIM is anticipated
- discard gloves if they are cracked, peeling, torn or punctured, or when their ability to function as a barrier is compromised
- remove any PPE or other clothing that is penetrated by blood, body fluids or OPIM; immediately, or as soon as reasonably practical

Workers shall not:

- reuse contaminated gloves, nor wash them or decontaminate them
- eat, drink, smoke, apply cosmetics or lip balm, or handle personal contact lenses where there is a potential of exposure to blood, body fluids or OPIM
- Where a potential exposure to or contact with blood, body fluids or OPIM has occurred, the Worker shall:
- wash their hands with soap and water immediately, or as soon as reasonably practical, or wash their hands immediately after removing potentially contaminated gloves or any other potentially contaminated PPE
- wash any area of the body as soon as possible after exposure or contact
- flush mucous membranes with water, as soon as possible after exposure or contact

Additional preventive measures shall include:

- equipment or surfaces that may be contaminated by blood, body fluids or OPIM shall be decontaminated, preferably by the Worker involved, if able to perform this task (e.g., a Worker is cut, but able to apply their own bandage and wash the affected surfaces)
- if a Worker is unable to wash a contaminated surface or area, then another trained Worker shall carry out the decontamination, using appropriate disinfectant and PPE, in accordance with procedures
- all contaminated or potentially contaminated material (including PPE) shall be placed by the involved Worker(s) in a designated receptacle for collection, prior to leaving the work area

All Enbridge Locations shall post warning signs and label storage or collection containers, as required by procedures associated with this Standard. Warning signs shall be fluorescent orange, with lettering and symbols of a contrasting color. Storage or collection containers shall be identifiable, e.g., red bags or other suitable, labeled containers.

Enbridge Employees should refer to the Bloodborne Pathogens Procedure in the GDL, (under IMS-04 Tier 2 procedures) for additional responsibilities, instructions for medical follow-up, vaccinations, paperwork, and records.

10.3 **Standard Precautions**

Standard Precautions are based on the premise that all blood and bodily fluids are considered infectious and shall be treated as such. Workers shall:

- wash their hands as soon as possible after any exposure to blood or bodily fluids, including their own
- cover cuts and scrapes effectively and completely with bandaging to prevent the transmission of their own blood and bodily fluids, and to also prevent their own exposure to blood or bodily fluids from other sources
- apply fresh bandaging to their own cuts/scrapes as needed during a work shift
- discard single-use items once application is complete

10.4 **First Aid**

The number of first aiders at an Enbridge Location and their level of training shall be established according to local Applicable Legislation.

The requirements for medical staff and their level of qualification shall be established according to Applicable Legislation.

If a Worker is injured or wounded (e.g., cut, scrape, open wound) during water washing operations (e.g., when operating or working near a water lance), seek medical attention. Such wounds have a high risk of infection.

Wounds caused by a water lance should be treated in the same way as other wounds, except for the following steps:

- after bleeding has stopped, pour bottled or clean running water over the wound
- if possible, leave unclean wounds open until they have been assessed by a medical professional

A Medical Plan shall be established at Enbridge Locations where access to emergency services is limited. The plan shall include:

- directions to nearest hospital(s)
- relevant evacuation information (such as air ambulance, nearby medical transport, etc.)
- medical staff (as required)

11.0 Safety Equipment Standard

11.1 First Aid Equipment

First Aid Kit

All Enbridge Locations and vehicles shall be equipped with first aid kits.

Identification of each first aid kit shall include the words ‘FIRST AID’ or the first aid symbol.

For Enbridge vehicles, first aid kits shall be

- secured in an accessible location
- inspected monthly and re-stocked as necessary

First aid kits shall be:

- installed in conspicuous location that is accessible at all times to all Workers
- inspected monthly and re-stocked as necessary

At Enbridge Locations where Workers are present, posted notices shall identify the location of first aid kits. Notices shall be easily visible and posted at practical locations where Workers and Visitors will see the notice, such as:

- at building entrances
- In and around the building or Site, e.g., in elevators, on notice boards, etc.
- on each Site Safety Plot Plan and/or Emergency Evacuation Plan

At unattended Sites or locations where Workers are not regularly present, place the first aid notices on the outside of the building, including a statement that first aid supplies are available inside and clearly noting the storage location.

Where required by Applicable Legislation, a first aid manual and list of required first aid supplies shall be included inside each first aid kit.

Eyewash Stations

Enbridge Locations shall have eyewash stations available in work environments where workers may be exposed to chemical hazards.

Contractors are responsible to provide adequate quantities of eyewash, based on the type and quantity of chemicals present on the Worksite, and in accordance with the information or directions on the applicable SDSs, plus the Hazard Assessment for that Location.

Enbridge requirements for Contractors and Enbridge Locations include:

- Locate an eyewash station within 7.6 m (25 ft.) of harmful chemicals (e.g., strong acids or caustics) or where the Hazard Assessment determines an eyewash station is required.

- All types of eyewash stations shall be clearly identified and readily accessible. Do not block access; areas around the station shall be kept clear.
- Supply tepid (lukewarm) potable water for fixed plumbed systems. Placement of portable systems should consider the availability of access to potable water.
- Inspect plumbed, self-contained and portable eyewash equipment monthly. All models shall have approved nozzle caps (to prevent foreign matter buildup) and be cleaned and mounted correctly.
- For self-contained eyewash stations and unsealed portable eyewashes, change the flushing fluids quarterly, or as specified by the manufacturer. If using water, add a preservative to maintain freshness; there are commercial additives that can help prevent freezing and micro-organism build-up.
- At isolated or remote work areas, at least one portable eyewash (squeeze bottle) shall be available anywhere there is a potential hazard from chemicals.
- Locate squeeze bottles close to the chemical hazard and protect each bottle from the elements (e.g., prevent freezing).
- During inspection, ensure the eyewash equipment is clean; placed in its a designated location. Also ensure sufficient eyewash fluid is available. When inspecting portable eyewashes, ensure the seal is not broken or past the expiry date. If expired, replace immediately or at the earliest possible date.

Fixed eyewash stations may be plumbed into the potable water system or have a reservoir. In addition:

- fixed eyewash stations should be mounted so the discharge nozzles are between 74-91cm (29-36 in.) off the ground
- remote fixed eyewash stations that do not have a constant potable water supply shall also have an emergency eyewash station capable of providing approximately 15 minutes of continuous flushing
- during each inspection of a fixed eyewash station, flush the line and verify proper operation

Automated External Defibrillator

An Automated External Defibrillator (AED) is a machine that can monitor heart rhythms. If required, it can deliver an electric shock to the heart in an attempt to correct heart arrhythmia.

At permanent Enbridge office locations where emergency medical response times are more than 4 minutes, an AED shall be kept with the First Aid Kit as part of the standard first aid supplies.

Project, Regional or Departmental EH&S committees may consider placement of an AED at additional Sites or locations, in cases where:

- the Site or location has 6 or more employees; and/or
- the emergency medical response time for that location is greater than 20 minutes; and/or
- the project safety plan determines their need

Additional AED requirements include:

- if a project is legally required to have a first aid room, a AED shall be kept in the room
- each AED shall be mounted on a wall or stored in a cabinet with proper signage and protective casing
- only Workers trained in the use of an AED are authorized to use an AED
- AEDs are not intrinsically safe and shall not be stored in Hazardous Areas
- inspect AEDs in accordance with manufacturers' specifications

Before purchasing an AED model, please contact the Corporate Health & Safety to confirm approved AED models for purchase.

Contractors and First Aid

Contractors shall provide first aid supplies (e.g., first aid kits, blankets, stretchers and splints) to Contractor personnel and crews in accordance with Applicable Legislation.

Where Mobile Treatment Centers (MTCs) are required, they shall be equipped with supplies suitable to the scope of practice of the attendants and the medical control guidelines.

Examples of required equipment include:

- AEDs and anaphylaxis kits for use by EMTs
- ALS equipment for use by Paramedics (where specifically required)

11.2 Portable Atmospheric Monitoring and Sampling

Personal monitors shall be worn by each individual when:

- working in Confined Spaces
- removing storage tank seals, tank man ways or tank mixers
- entering tanks that have not been cleaned and freed of gas
- work associated with Open Systems, such as scraper traps and provers
- spill or leak containment, clean-up and repairs
- required by Regional Operations as noted on the SWP
- when required based by a Hazard Assessment

When a monitor is not required for each individual, the number of monitors shall be determined by the project safety plan, the site specific plot plan, or based on a Hazard Assessment.

Where personal monitors are not required (based on Atmospheric Monitoring and the Hazard Assessment), crews working in Hazardous or Restricted Areas shall use area monitors.

Contractors shall provide appropriate Atmospheric Monitoring and detection equipment unless otherwise noted within the bid documents or at the Request for Proposal (RFP), or at the pre-job meeting.

When necessary, specific atmospheric hazard measurement devices shall also be provided by the Contractor, e.g., if mono-styrene, acetone, benzene or other hazards are present. Enbridge shall inform the Contractor when there is the potential for respiratory hazards or contaminants that may not be detectable by standard 4-head monitors.

Workers shall:

- be trained to operate and maintain the types of portable and/or personal gas monitors used at the Location
- follow manufacturers' specifications regarding operation, servicing, bump testing and calibration

The alarm set points of portable gas monitors shall be set in accordance with Table 1.

Table 1-Portable Gas Monitor Alarm Set Points

	H_2S	**LEL**	**CO**	**O_2**
low alarm	10 ppm	10% LEL	25 ppm	19.5%
high alarm	20 ppm	20% LEL	190 ppm	23.5% (US) 23% (Can)
STEL alarm	15 ppm	N/A	190 ppm	N/A
TWA alarm	10 ppm	N/A	25 ppm	N/A

Personal gas monitors shall:

- have 4-head functionality: O_2, CO, LEL and H_2S
- be worn within 25 cm. (10 in.) of the breathing zone (area around mouth and nose)
- not be placed into shirts, coveralls or jacket pockets unless the pockets are specially designed to hold portable gas monitors (i.e., mesh pocket)
- provide a visual and audible alarm that is equipped with low and high alarm points
- be recharged in a safe area, away from the area being monitored; carry out recharging as soon as possible after the low-battery indicator activates, to ensure the monitor does not shut down

An area monitor consists of at least 1 individual wearing a monitor who remains in the affected area at all times during the work activity. Area monitors shall:

- be capable of monitoring the potential hazard
- be equipped with a visual alarm (i.e., red indicator that lights when alarm levels are reached) in addition to an audible alarm, where possible
- be placed where the atmospheric hazard is likely, based on the substance (e.g., placed at lower levels when monitoring for substances heavier than air)
- be used where there is potential for exposure to atmospheric hazards, including, but not limited to:
    - Confined Spaces
    - Open Systems
    - venting systems
    - leak sites
    - Hazardous Areas
    - Restricted Areas
    - when actively working within 30 m (100 ft.) of Ground Disturbance work which is taking place within 3 m (10 ft.) of operating Facilities

(e.g., gas or oil pipelines, above or below ground); in such cases, there shall also be continuous gas monitoring, as determined by the Hazard Assessment

Combustible gas monitors do not provide accurate readings in an oxygen-deficient atmosphere.

Passive monitors assess the atmosphere without the use of a pump. Active monitors have internal pumps that draw atmospheric samples from the immediate area or from a distance (e.g., inside a pipe, sump, booster pit).

Sampling Equipment

Sampling equipment (including multi-head continuous gas monitors) shall:

- be capable of sampling according to the potential hazard
- be positioned within a few feet of the work area and not interfere with the task, including:
    - at the source of the gas or vapor
    - low areas (for petroleum vapors and H2S)
    - the most representative location for Workers at the site
    - areas with the highest potential for exposure

When using grab sampling equipment such as detector tubes (e.g., Drager CMS) and photo ionization detectors (e.g., UltraRae) Workers shall:

- obtain multiple grab samples to obtain representative exposure information
- always follow manufacturers' guidelines for testing time limits and specifications, but combine with Atmospheric Monitoring best practices
- stop Atmospheric Monitoring and leave the work area (following applicable safety procedures) when alarms are activated before specified length of time for measurement (i.e., one minute)

For Atmospheric Monitoring of Open Systems, gathering systems and Sites of the mainline systems Workers shall:

- wear half-face air purifying respirators with combination acid gas/organic vapor cartridges until H_2S, LEL, benzene and mercaptans (if applicable) levels can be verified through initial Atmospheric Monitoring
- conduct Atmospheric Monitoring periodically to re-evaluate whether existing practices and control measures are adequate for protecting Workers at newly detected levels of chemical exposures; the frequency of Atmospheric Monitoring shall be determined by the Hazard Assessment
- document testing results on the SWP

During initial Atmospheric Monitoring, Workers shall:

- document the initial Atmospheric monitoring results on the SWP, and if required based on the Hazard Assessment, document continuous Atmospheric Monitoring on the SWP at intervals determined by the Hazard Assessment
- prior to performing any work, conduct a minimum of one atmospheric test for benzene with a grab sampling instrument or PID and one test for H_2S and LEL with a multi-head gas detector at a minimum of 300 mm (1 ft.) directly perpendicular to the Open Systems
- ensure measurements are taken at the downwind side regardless of the atmospheric tester/operator position relative to the Open Systems
- ensure Atmospheric Monitoring for mercaptans with grab sampling equipment is conducted for coker naphtha products
- ensure these requirements are evaluated as part of the pre-job Hazard Assessment
- refer to Confined Space Standard for initial Atmospheric Monitoring and ongoing testing requirements in Confined Spaces section of this manual

A functional test is a brief exposure of the monitor to a concentration of gas(es) in excess of the lowest alarm set-point for each sensor. This test verifies sensor and alarm operation.

Follow manufacturers' specifications regarding operation, servicing, bump testing and calibration.

If an instrument fails a bump test or a calibration check, the Workers shall perform a full calibration on it before using it. If the instrument fails the full calibration, the Worker shall remove it from service.

Functional bump testing shall:

- be performed in accordance with the manufacturer's specifications before each day's use
- for the mainline systems, use pentane or pentane equivalent gases; when pentane equivalent methane is used for calibration, then methane can be used for bump testing
- for the vector system, use pentane or pentane equivalent gases for calibration, and methane for bump testing
    - when calibrated with pentane, a calibration gas with 0.35% pentane should be used to calibrate against 25% LEL. In this case, the default LEL setting should be set at 25% prior to applying the pentane calibration gas
    - when calibrated with pentane equivalent methane, a calibration gas with 1.25% methane should be used to calibrate against 50% LEL; in this case, the default LEL setting of portable gas monitors for calibration should be set at 50% prior to applying the pentane calibration gas

Contractors shall maintain bump test and calibration logs at the Site and make the logs available at the request of the Enbridge Representative.

Workers who calibrate Gas Detectors shall:

- calibrate to the frequency indicated in the manufacturer's specifications
- bump test portable gas monitors and verify calibration before every Confined Space Entry
- attach a gas detector inspection tag to each gas monitor, including calibration date and initials of the Worker who calibrated the monitors; no tag is required if an auto-calibration station is used for personal multi-gas monitors; however, the Worker shall follow Enbridge calibration requirements and the manufacturer's specifications for calibration
- tag the calibration record for multi-gas monitors and grab sampling equipment when shared with a group of Workers
- record calibration results of manually calibrated portable gas monitors in the Gas Monitoring Instrument Service Log and retain on site for 2 years; it is not required to maintain a Gas Monitoring Instrument Service Log for portable gas monitors capable of self-monitoring calibration cycles indicating when calibration is required

All calibration and maintenance activities, including the Gas Monitoring Instrument Service Log shall be documented and retained according to the document retention policy.

Personal monitors shall not be used when:

- they are past calibration date

- have not been bump tested
- there is a faulty sensor

Considerations for cold weather operation:

- Most manufacturers of gas detectors place the design lower limit at -10 to -20 °C; be sure to check the operating manual
- LCD screens will dim at temperatures from -15 to -25°C. Keeping the monitor inside your coat and attaching a pump will allow you to still read the screen
- The chemical reactions that occur in the gas detector begin to slow down at temperatures below -20°C longer monitoring is required to get a good reading
- Use of a hand warmer in the gas detector carrying case will help speed the reactions slightly, they will keep the LCD screen reading longer and they will help speed up the chemical reactions
- At temperatures -35 to -40°C, it is recommended to take a sample to the gas detector in a warm well ventilated building

11.3 Standard Safety Equipment

Table 1 identifies the standard safety equipment recommended at Enbridge Locations, plus any necessary PPE for a given location.

Wind socks are one type of standard equipment noted in Table 1.

Position wind socks in locations that are:

- away from wind currents caused by tanks or buildings
- high enough to avoid influence from equipment (however, if located too high, an accurate indication of wind movement at ground level may not be possible)
- easily visible, day and night (e.g., illuminated locations)

Boats

Boats shall meet or exceed the safety and environmental requirements in the Small Vessel Compliance Program (SVCP) and be equipped with safety equipment according to the Canada Shipping Act, 201(CSA 2001) [CAN] or the Federal Requirements and Safety Tips for Recreational Boats [USA].

Refer to Table 2 [CAN] or Table 3 [USA] to identify the standard safety equipment required on boats.

In addition to the standard boat safety equipment, the following additional equipment is recommended, depending on the size, location and use of the boat:

- VHF radio
- anchor/spare anchor
- heaving line
- first aid kit
- ring buoy
- oars or paddles
- tool kit

Vehicles

Table 4 identifies the standard safety accessories recommended for Enbridge-owned and leased vehicles, plus additional PPE where required.

Whenever practicable, use a certified towing agency to recover a vehicle.

If a towing agency is not used, follow these requirements when recovering a vehicle:

- recovery straps shall be nylon, with sewn loops at each end and at least 6 m (20 ft.) in length
- use the vehicle recovery equipment in accordance with the manufacturer's specifications, e.g., do not exceed the pulling strength limits of the recovery straps
- do not use lifting slings, snatch straps, chains, or recovery straps manufactured with chain and hook attachments

Contractor work vehicles shall have, at minimum, a first aid kit and fire extinguisher in each vehicle, along with the required notices on the vehicle to indicate the equipment is present.

Table 1- Summary of Safety Equipment at Enbridge Regional Locations

Equipment	Tank Station	Delivery/ Injection Location	Pump Station	Location with PLM Crew	Location with Mechanical Dept	Location with Electrical Dept
AED	as required					
air mover	as required					
benzene monitor	1	2	---	1	1	---
bonding and grounding cable and connections	—	—	—	2	—	—
cascade system (for refilling air cylinders)	as required					
eye wash station	as required					
fire blanket in suitable case	1	1	1	1	1	1
fire extinguisher and equipment	as required					
first aid kit	1	1	1	1	1	1
flashlight[1] (explosion-proof) and extra batteries	as required[2]					
floodlight (portable, explosion-proof)	—	—	—	2	—	—
ground mat	as required					
grounding cable: electrical cubicles (CAN) (USA) electrical dept (ENB [NW])	1	—	1	—	—	—
hoseline with egress bottle	—	—	—	as required	—	—
hydrogen sulfide monitor (or monitor with a hydrogen sulfide sensor)	1	2	—	1	—	—
lineman's belt	as required					
life buoy and rope	as required					
locks and tags for lockout	as required					
NGL flare pistol and 4 min/10 max signal flare cartridges	1	1	1 set per NGL facility	—	—	—
NGL personal protective equipment (required for Lines 1 and 5 service)	1 set	1 set	1 set per NGL facility	3 sets	—	—
portable gas monitor	1 per Worker + additional as required by this manual's Standards					
rubber gloves (electrician) and leather gauntlets	1 pair	—	1 pair	as required	—	2 pairs

Equipment	Tank Station	Delivery/ Injection Location	Pump Station	Location with PLM Crew	Location with Mechanical Dept	Location with Electrical Dept
safety harness and lanyard	2	—	2	4 (CAN) (USA) 1 (ENB [NW])	—	—
Scott Air-Pak	3	1 (ENB [NW])	2 (ENB [NW])	4 [3] (CAN) (USA) 2 (ENB [NW])	1	—
warning signs	as required					
wind sock	1	1	1	2 (portable)	as required	

NOTES
as required—determined by Site Supervisor

1. *Flashlights shall carry the Underwriters Laboratories label "approved for use in explosive atmospheres."*
2. *When working in areas without emergency lighting facilities, approved flashlights shall be available for immediate use.*
3. *Crews may store Scott Air-Pak at their work location or unattended locations under their control provided the equipment is readily available.*

Table 2- Boat Safety Equipment – CAN

Boat Size	Standard Equipment
< 6 m (19' 18")	• life jacket or PFD that meet the requirements in section 7.10 for each person on board • buoyant heaving line at least 15 m long • reboarding device (if vertical climbing height to reboard boat from water is over 0.5 m (1' 18") • manual propelling device or 1 anchor and at least 15 m (49' 3") of cable, rope or chain • bailer or manual bilge pump • watertight flashlight or 3 flares of type A, B, or C • sound signaling device or appliance • navigation lights (if operated in fog, after sunset, restricted visibility) • 5BC fire extinguisher
> 6 m (19'8") & < 9 m (29'6")	• life jacket or PFD that meet the requirements in section 7.10 for each person on board • buoyant heaving line at least 15m long or 1 lifebuoy attached to a buoyant line at least 15 m (49'3") long • reboarding device (if vertical climbing height to reboard boat from water is over 0.5 m (1' 18") • manual propelling device or 1 anchor and at least 15 m (49' 3") of cable, rope or chain • bailer or manual bilge pump • watertight flashlight or 6 flares of type A, B, or C • sound signaling device or appliance • navigation lights (if operated in fog, after sunset, restricted visibility) • 5BC fire extinguisher • if equipped with a heating device or cooking appliance, 1 additional 5BC fire extinguisher
> 9 m (29'6") & < 12 m (39'4")	• life jacket or PFD that meet the requirements in section 7.10 for each person on board • buoyant heaving line at least 15m long or 1 lifebuoy attached to a buoyant line at least 15 m (49'3") long • reboarding device (if vertical climbing height to reboard boat from water is over 0.5 m (1' 18") • anchor and at least 30 m (98' 5") of cable, rope or chain • manual bilge pump or bilge-pumping arrangements • watertight flashlight • 12 flares of type A, B, C or D not more than 6 of which are type D • sound signaling device or appliance • navigation lights • magnetic compass • 10BC fire extinguisher • if equipped with a heating device or cooking appliance, 1 additional 10BC fire extinguisher

Table 3- Boat Safety Equipment – USA

Boat Size	Standard Equipment
<16 ft	• USCG[1]-approved life jacket per occupant • electric distress light or, if operating between sunset and sunrise, 3 combination (for both day/night use) red flares • Class BI fire extinguisher • sound signaling device audible for ½ mi / 4 to 6 sec • red and green navigational sidelights lights visible from at least 1 mi • an all-round white light, or a masthead light and a sternlight; all visible from at least 2 mi
>16 ft to <26 ft	• USCG[1]-approved life jacket per occupant and 1 Type IV personal flotation device • orange distress flag or electric distress light, or 3 handheld or floating orange smoke signals and 1 electric distress light, or 3 handheld, meteor or parachute type combination (for both day/night use) red flares • Class BI fire extinguisher • sound signaling device audible for ½ mi / 4 to 6 sec • red and green navigational sidelights lights visible from at least 1 mi • an all-round white light, or a masthead light and a sternlight; all visible from at least 2 mi

NOTES

1. *United States Coast Guard*

In addition, vessels operating in the State of New York also shall be equipped with an anchor and line of sufficient strength to provide the vessel with safe anchorage.

Table 4- Summary of Safety Accessories for Enbridge Regional Vehicles

Equipment	Tank Station Vehicle	Delivery Injection Vehicle	Regional Office Vehicle	PLM Vehicle	Mechanic Vehicle	Electrician Vehicle	Office Super-visor Vehicle (EPSI)	Field Vehicle (EPSI)	Emer-gency Response Vehicle (EPSI)	Leased Vehicle
area maps	—	—	as required							
booster cable	—	—	1	1	1	1	1	1	1	1
chain, rope and booster to secure loads (ENB [NW])	—	—	—	1 set	—	—	—	—	—	—
portable gas monitor	as required									
disposable camera	as required									
fire blanket in suitable case	—	—	—	1	—	—	—	—	—	—
fire extinguisher–5 or 10 lb. dry chemical extinguisher	1	1	1	1	1	1	—	1	—	—
fire extinguisher–30 lb. dry chemical extinguisher	—	1	—	1 (2 if ≥1 ton)	—	—	—	1	—	—
first aid kit	1	1	1	1	1	1	1	1	1	1
flags/red cloth	—	—	—	2	—	—	—	—	—	—
flashing amber light	—	—	as required	1	1	1	—	—	1	—
flashlight	as required									
NGL flare pistol and 4 min/10 max signal flare cartridges	—	—	as required	1	1	1	—	—	1	—
shovel	—	—	1	1	1	1	1	1	1	*as required*
snow brush	1	1	1	1	1	1	1	1	1	1
spare tire	1	1	1	1 if <1 ton as required if ≥1 ton	1	1	1	1	1	*as required*
standard tool kit	—	—	1	1	1	1	—	1	—	—
tire pressure gauge	1	1	1	1	1	1	1	1	1	1
tire inflator sealer	As required									
tire jack	1	1	1	1	1	1	1	1	1	1
vehicle recovery strap	as required						1	1	1	as required

Equipment	Tank Station Vehicle	Delivery Injection Vehicle	Regional Office Vehicle	PLM Vehicle	Mechanic Vehicle	Electrician Vehicle	Office Super-visor Vehicle (EPSI)	Field Vehicle (EPSI)	Emer-gency Response Vehicle (EPSI)	Leased Vehicle
warning reflector / road hazard triangles	—	—	3	3	3	3	1	1	1	1
winter survival kit	—	—	as required				—	—	—	—

NOTES
as required—determined by Site Supervisor

12.0 Vehicles and Mobile Equipment Standard

12.1 General Requirements for Drivers

Workers who drive or operate vehicles shall comply with:

- Enbridge's Driver's License and Driving Record Policy
- Contractor personnel shall adhere to their own Driver's Licensing and Driving Record policies
- and all Applicable Legislation

Prior to operating a vehicle, Workers shall:

- be properly trained according to the applicable training matrix
- be aware of their health and safety responsibilities with regards to driving
- complete training in the use of required safety equipment (e.g., warning devices, fire extinguishers, PPE, etc.)

Workers shall NOT operate any vehicle, NOR permit another person to operate any vehicle, if the vehicle or its equipment is in a condition that is likely to cause danger to a person or property.

In addition, Workers shall:

- possess a valid driver's license for each type of vehicle they operate, and have the correct license in their possession when operating a vehicle
- maintain a good driving record and submit driver's abstracts when required
- retain each vehicle's current registration and insurance information in the cab of each vehicle
- comply with all other driving-related Enbridge policies and procedures (e.g., driver responsibilities, recordkeeping, conduct and discipline, drug and alcohol, distracted driving, load security, log books and inspection Standards)
- immediately report all Motor Vehicle Incidents (MVI), driver's license violations and suspensions to their People Leader
- obey all traffic signals and posted speed limits
- drive slowly and with caution, as appropriate, e.g., when road or driving conditions are poor or hazardous, and/or when Workers or other people are present
- drive defensively at all times
- only operate properly equipped and maintained vehicles
- properly use all of the safety mechanisms installed on vehicles, including seat belts
- ensure that all vehicle occupants are wearing their seat belts at all times when the vehicle is in motion

Other driving-related requirements include:

- never operate a vehicle with a person in the bed of the vehicle
- where equipment is in operation, do not stop, park, or pass through the area without the equipment operator(s) acknowledging your presence; follow the directions of flag persons/traffic signals, when present
- when parking on roadways, black top or gravel, park on the working/right side if the roadway (if safe to do so)
- when driving in adverse conditions – such as rain, snow or ice – allow plenty of distance for stopping

- when driving in adverse conditions – such as rain, snow or ice – accelerate at an even rate to avoid skidding and to safely enter the flow of traffic
- before fueling, always shut off the vehicle
- never smoke near a fueling area or fuel station
- never overfill a fuel tank and never leave the fuel nozzle unattended
- never use a cellular device while fueling

Towing operations shall only be performed by Qualified operators.

12.2 Distracted Driving and Use of Communication Devices

Workers shall avoid distracted driving at all times.

Drivers or operators shall NOT:

- engage in actions that cause a loss of attention to the safe operation of the vehicle
- use any communication device while driving any type of vehicle, including mobile phones (including texting/e-mailing), laptop computers, or 2-way radios

Hands free operation (e.g., Bluetooth) shall not be permitted unless a vehicle is legally and safely parked.

Before using a mobile phone or other communication/electronic device, a vehicle operator shall be legally and safety parked.

Radios may only be used by operators when operating a vehicle or boat on a radio controlled road/waterway without passengers. Crane operators may use radios during a radio-controlled lift if identified on the Lift Plan/Hazard Assessment.

This requirement applies to the operation of all vehicles, including Powered Mobile Equipment, Powered Mobile Elevating Work Platforms, ATV's, UTV's, snowmobiles and watercraft.

Safe Use of GPS Equipment

When using a Global Positioning System (GPS) in a vehicle, Workers shall ensure:

- the GPS unit is properly affixed to the vehicle prior to driving
- the GPS is programmed prior to driving
- safely park the vehicle prior to making programming changes to GPS units

12.3 Vehicle Safety and Signage

All Worksite Workforce vehicles over ¾ ton shall:

- have backup alarms installed that:
  - operate automatically when reverse is engaged
  - are clearly audible above background noise
- have headlights on when in operation
- have all required safety accessories including, but not limited to:
  - secured fire extinguisher
  - first aid kit
  - roadside emergency kit
  - winter emergency kit where applicable

- buggy whip, where required (e.g., Mainline Construction)

Enbridge Visitor rentals, short duration rentals and personal vehicles have separate requirements. For additional information, Enbridge Employees should consult the Enbridge Vehicle Rental Policy on eLink.

Safe Use of Trailers and Hitches

When using trailers and hitches, Workers shall:

- test signal lights and brakes prior to departure
- test and calibrate auxiliary brakes prior to departure; if equipped with breakaway cable, check the cable length and ensure the coupling is fully plugged in
- use adequately sized tow chains that are securely fastened
- cross the tow chains to prevent the hitch from contacting the ground if it becomes disconnected
- secure the coupling latch (e.g., pin, lock, bolt and nut) after coupling the trailer to the towing vehicle
- secure all loads
- visually inspect trailers and hitches prior to each trip
- have the trailer ball-mount assembly removed from the receiver when not in use
- ensure hitch and receiver are compatible and correctly sized

Trailers are required to have functional lighting when in use.

Visual Safety Checks

At least once each day that a vehicle is in use Workers shall conduct a vehicle safety check of their assigned vehicle, including but not limited to:

- tires/wheels/rims
- lights/reflectors
- steering
- turn signals
- horn
- rear vision mirrors
- windshield and wipers

Report any defects to your immediate people leader/supervisor. Defects that cause that vehicle to be considered un-drivable (according to local Applicable Legislation) shall be immediately corrected.

Vehicle Markings

All vehicles shall be marked as determined by Regional/Site Management.

The following standard decals shall be affixed when required:

- first aid kit
- boosting battery (see vehicle owner’s manual for boosting hybrid vehicles)
- walk around your vehicle
- fire extinguisher inside

Reflective stripes on Enbridge Operations vehicle roofs are optional; their use is at the discretion of regional management. When used:

- place reflective stripes diagonally, from left front to right rear
- roof striping shall be red in color

Enbridge owned vehicles and equipment licensed for highway use shall have reflective stripes placed in the rear of the vehicle, with the exception of cars and vehicles designated as non-emergency response by regional/site management. Rear striping shall be red, alternating with white. Stripes shall be at least 5 cm (2 in.) wide.

Reflective stripes on the rear of truck tractors shall comply with the regulations of the Federal Motor Vehicle Carrier Safety Administration (FMCSA) [USA] or Transport Canada [CAN].

Vehicle recovery straps (tow ropes), including the attachment hardware, shall be labeled with their assigned strength and safety ratings. Tow ropes and hardware shall be of adequate pulling strength to ensure the weight of the vehicle can be safely towed. Chains shall not be used for towing.

12.4 **Vehicle Operation**

Workers operating vehicles shall:

- perform a walk-around prior to moving any parked vehicle checking for:
    - potential obstructions and approach distances
    - fluids on/under the vehicle
    - vehicle damage
    - adequate tire inflation and any sharp objects or foreign material in the tire treads
    - clear visibility, including any damage or cracks to the windshield and rear/side windows
- back into a space when safe to do so
- pull through a parking space when it is possible
- secure and/or mount materials, tools and equipment against movement when stowed in the same compartment as Workers, or erect barriers to safely separate Workers from stowed items
- secure truck bed and trailer bed loads against movement
- when reversing without back-up alarm or Spotter, honk prior to reversing

When required and the worksite is secure, Workers shall have keys easily accessible so that the vehicle may be moved if necessary, e.g., due to site conditions or congestion, or in the event of an emergency.

Workers shall:

- not allow any person on the bed of a truck during winching operations
- not operate a vehicle that is loaded in excess of maximum capacity
- only have vehicles required for the completion of work activities in the immediate Worksite; all other vehicles shall be parked in approved areas
- not back the vehicle up when the view is obstructed, unless
    - there is a Spotter
    - the reverse signal alarm is operational
    - a circle check is performed

Securing Loads with Load Binders

When securing loads with load binders, Workers shall:

- use the load binders properly, to avoid serious injury
- never use cheater pipes (snipes)
- never operate a load binder while standing on the load
- use load binders with legible load ratings
- hook load binders so they can be operated while standing on the ground
- position the load binder so its handle can be pulled downward to tighten the chain
- position themselves out of the path of the moving handle and any loose chain
- release the handle with an open hand under the handle by pushing upward (never close your hand around the handle)
- if sufficient leverage cannot be obtained using the lever-type load binder by itself, a ratchet type binder shall be used
- visually inspect web binders before each use for webbing and ratchet damage
- visually inspect the chain binders before each use for:
    - excessive wear
    - twisted or distorted links
    - excessive stretch
- remove load binders from service and replace if damaged or weakened

Vehicle Operations near Wildlife

Workers driving in areas where wildlife may be present or active shall:

- pay attention to wildlife crossing signs
- continually scan the fields and areas adjacent to the roadways, especially near dawn or dusk, at night, and during mating season
- slow down when the first wildlife crossing sign is sighted, and/or when wildlife is observed on or near the roadside (the presence of one animal may indicate others are near, as some wildlife, such as deer, may be present in groups)

12.5 Commercial Motor Vehicles- Canada

This subsection applies to all Canadian Regions operating commercial vehicles and trailers that have a Registered Gross Weight of more than, or that weighs more than 4500 kg.

Contractors shall have their own Commercial Motor Vehicle program which meets all applicable Canadian legislation.

Regions are responsible for:

- designating a Commercial Motor Vehicle (CMV) representative
- ensuring proper registration and liability insurance for each CMV
- ensuring Workers possess the proper type of license to drive their assigned vehicle

In addition, Regions shall conduct periodic internal reviews to ensure continued compliance with Applicable Legislation and adherence to Enbridge Standards. Such reviews shall include, but not be limited to:

- driver files, hours of service, vehicle files, accident analysis, driver training

- other safety systems to ensure continued compliance with Applicable Legislation
- vehicle checks to ensure current and correct documentation is in each vehicle, including insurance documents and any required inspection and maintenance documents, such as Commercial Vehicle Inspection Program (CVIP) or Commercial Vehicle Safety Alliance (CVSA) inspections

The CMV representative shall ensure the following is maintained:

- driver files
- vehicle inspection, repair, lubrication and maintenance scheduling
- vehicle information

A Federal Operating Status authorizes a carrier to operate CMVs throughout Canada and applies to vehicles registered for a weight of more than 4500 kg.

Do not operate, or permit another person to operate, a CMV if the vehicle or its equipment is in a condition that is likely to cause danger to person or property.

In addition to their normal driving responsibilities, all CMV drivers shall:

- comply with federal, provincial, territorial and municipal laws
- report to a vehicle inspection station when required
- maintain all required documentation

If a defect is identified during vehicle operation, record it on the Trip Inspection form and:

- if the defect is major, report it immediately to the People Leader
- if the defect is minor, report it in a timely manner to People Leader, e.g., at end of work shift or at beginning of next work shift

No CMV or other assigned vehicle is permitted to be driven until major defects have been repaired or corrected.

Regions may develop their own region specific plans to address:

- identification of responsibilities
- driving limitations/hours of service
- record keeping and daily log completion, distribution and retention
- driving cycles
- designation of home terminal and principal place of business
- inspection and maintenance
- creation of region specific documents such as daily logs

Drivers Abstracts

For documentation, the use of Commercial Driver Abstracts is recommended.

- CMV drivers shall obtain driver abstracts at least once every 12 months or as requested
- newly hired drivers shall provide an initial 30 day abstract at the time of hiring; thereafter, a new abstract shall be obtained at least once every 12 months

Hours of Service

Federal hours of service regulations require three types of limitations to a driver's time. The limits are outlined below:

- daily limits – a day is defined as a 24-hour period that begins at the hour designated by the carrier and noted on the log for the duration of the driver's cycle
- workshift limits – a workshift is the period that begins when a driver begins work or is required by the motor carrier to be available for work (prior to

starting a workshift, the driver shall have at least 8 consecutive hours off-duty)
- cycle limits- see Table below

Drivers shall comply with all three types of driving time limits.

Daily Limits	Workshift Limits	Cycle Limits
13-hours driving time in a day	13-hours driving time in a workshift	Cycle 1 maximum 70 hours on-duty in 7 consecutive days (36 hours off required between cycles)
14-hours on-duty in a day	14-hours on-duty in a workshift	Cycle 2 maximum 120 hours on-duty in 14 consecutive days
Minimum 10-hours off-duty in a day	Maximum 16-hours elapsed time in a workshift	

Due to the cumulative effect of being tired over several days and weeks, the hours of service regulations include a maximum number of on-duty hours that drivers can accumulate before they are required to take time off to reset. On-duty time includes both driving time and other non-driving duties carried out during the working hours.

Cycle hours are calculated by adding the on-duty hours of the current day to the on-duty hours of the previous 6 or 13 days. If a driver reaches the cycle limit, they shall stop driving until they reset their cycle.

- Cycle 1: 70 hours on-duty in 7 consecutive days (after which 36 consecutive hours shall be taken off to reset)
- Cycle 2: 120 hours on-duty in 14 consecutive days (providing that the driver takes 24 consecutive hours off-duty time so as to never accumulate more than 70 hours of on-duty time during the 14 day cycle period without taking 24 hours off)

Each crew shall choose whether each driver will follow cycle 1 or cycle 2.

A driver is in violation when driving in excess of the cumulative hours specified in a cycle. If a driver reaches a cycle limit, the driver shall stop driving and take the required time off.

All drivers shall meet the medical standards outlined in the National Safety Code (NSC) of Motor Carriers.

Inspections and Maintenance

Inspect heavy duty vehicles with a gross vehicle weight or gross combination weight rating greater than (>) 4500 kg in accordance with the NSC for Motor Carriers and record on the Vehicle Inspection Form. Inspect, repair and maintain trailers in accordance with the Commercial Vehicle Maintenance Standards.

Ensure that every Enbridge owned or leased vehicle, including trailers, meets the maintenance requirements of local and provincial/territorial maintenance standards, as well as any specified in Maximo Job Plans.

Drivers shall ensure that CMVs and trailers that require an annual or semi-annual Commercial Vehicle Inspection Program (CVIP) inspection are inspected prior to operation.

Each region or Contractor company shall have a system that records and tracks the inspection, maintenance and repair history for each owned or leased vehicle. The records shall be written or electronic (e.g., Maximo) and shall include:

- identification of each vehicle including unit number
- manufacturer serial number or VIN
- make and year of vehicle
- copy of Trip Inspection reports
- CVIP documents
- repair, lubrication and maintenance for each vehicle
- odometer readings, with dates
- any modifications or manufacturer defects/recalls (plus corrective action taken regarding the notice)
- nature of inspection or work performed on vehicle

Records for repair of defects shall be attached to the inspection form in which the defect was first recorded. Include these records in the applicable unit file.

Trip Inspections

Trip Inspections are a continuous process designed to protect drivers and identify any mechanical problems in the commercial fleet.

Written vehicle pre- and post-trip inspections are required for any vehicle with a registered gross vehicle weight greater than (>) 4500 kg. Use the Trip Inspection form for these inspections.

As part of each Region's commercial driving procedures, all drivers shall be instructed to conduct proper and effective Trip Inspections. At a minimum, Trip Inspections shall include:

- date and time of inspection
- license plate number, commercial vehicle identification number or unit number of commercial vehicle
- record of odometer or hubometer reading of commercial vehicle at time of inspection
- name of carrier operating commercial vehicle
- name of municipality or location on highway where commercial vehicle was inspected
- each defect in the operation of every item required to be inspected in accordance with Section 10 of NSCMC: Standard 13, Part 2 or that no defect was detected
- name of person who inspected commercial vehicle and include a statement signed by that person stating the commercial vehicle had been inspected in accordance with applicable requirements under Section 10 of NSCMC: Standard 13, Part 2
- name and signature of driver or person making the report
- all applicable items identified in Schedule 1 of NSC Standard 13: Trip Inspections

Report any defects identified on a trip inspection and take appropriate action (including taking the vehicle out of service if a defect is detected or as required by Applicable Legislation).

Repairs of major defects shall be documented and certified. After a major defect is repaired, all documentation which noted the defect shall be amended to certify the defect was repaired or corrected, or that no repair was necessary.

Records for repair of defects shall be attached to the inspection form in which the defect was first recorded. Include these records in the applicable unit file.

No CMV can be operated or driven on a highway unless inspected and deemed fit for duty.

CMV drivers shall submit completed Trip Inspection documents within 20 days of completion.

Daily Logs

Driver shall maintain true and accurate daily logs for each calendar day. The logs shall account for all of the driver's on-duty and off-duty time for each day. The daily log shall contain:

- name of driver and, if the driver is a member of a team of drivers, names of other drivers on the team
- date and starting time for the driver's day
- commercial vehicle license plate or unit number
- odometer reading of vehicle
- name and address of home terminal or principal place of business of every motor carrier by whom the driver was employed or otherwise engaged during that day
- if the motor carrier or driver was not required to keep a daily log immediately before the beginning of the driver's day, the driver's number of hours of on-duty and off-duty time that were accumulated each day, including the duration and time of the driver's last rest period, during the 14 days immediately before the beginning of the driver's day
- the cycle that driver is following (cycle 1 or 2)
- if applicable, a declaration in the 'Remarks' section of the daily log that clearly indicates the driver is deferring off-duty time under section 6 of NSCMC Standard 9 and whether the driver is operating under day 1 or day 2 of that provision

Drivers shall submit each daily log and supporting documents within 20 days of completion.

As required, drivers shall keep proper documentation and records of bills of lading, manifests, dangerous goods documents, time records, driver's daily logs and weigh slips.

All records pertaining to daily logs, vehicle inspection, maintenance and repair shall be kept according to Applicable Legislation.

Drivers carrying cargo

Drivers carrying cargo shall:

- ensure that all cargo transported inside and on a CMV is contained, immobilized or secured according to all provincial, state and federal standards. Training in this area is required for anyone driving a CMV
- drivers shall not use any vehicle to transport material unless the vehicle is constructed to carry the material and the vehicle is capable of being safely operated when loaded
- inspect the cargo and its securing devices within the first 80 km after beginning a trip and re-inspect when there is a change of duty status, after driving 3 hours, and after driving 240 km

Ship all dangerous goods in accordance with TDG and Applicable Legislation. Ensure all Workers transporting dangerous goods are properly trained in the transportation of dangerous goods.

12.6 **Commercial Motor Vehicles- United States**

This section applies to:

- all U.S. regions that operate Commercial Motor Vehicles (CMVs) and trailers licensed to Enbridge that have a registered gross vehicle weight rating, gross combination weight, or gross combination weight rating of 10,000 pounds or more; and
- Regions that operate vehicles of any size that transport hazardous materials requiring the vehicle to be placarded.

Contractors shall have their own CMV program which meets all Applicable Legislation.

Regions are responsible for:

- designating a CMV representative
- ensuring proper registration and liability insurance for each CMV
- ensuring Workers possess the proper type of license to drive their assigned vehicle

In addition, Regions, Projects, training coordinators and Human Resources (HR) shall conduct periodic internal reviews to ensure continued compliance with Applicable Legislation and adherence to Enbridge Standards. Such reviews shall include, but not be limited to:

- federally required training for drivers and supervisors
- driver files, hours of service, vehicle files, accident analysis, driver training
- other safety systems to ensure continued compliance with Applicable Legislation
- vehicle checks to ensure current and correct documentation is in each vehicle, including the Safety Fitness Certificate, insurance documents, and any required inspection and maintenance documents, such as Commercial Vehicle Inspection Program (CVIP) or Commercial Vehicle Safety Alliance (CVSA) inspections

The CMV representative shall maintain:

- vehicle inspection, repair, lubrication and maintenance scheduling
- vehicle information
- maintain hours of service records

CMV drivers shall have a single, valid Commercial Driver's License (CDL) to drive Enbridge CMVs that have a gross combination weight or gross vehicle weight of 26,001 pounds or more, or a vehicle of any size used to transport hazardous materials requiring a placard.

Enbridge Employees who are required to drive CMVs shall complete a Driver's Application for Employment form, which shall be kept in the Driver's qualification file. Driver files shall be kept by Human Resources.

Before operating a CMV on a public road, the driver shall:

- ensure the CMV is in safe operating condition
- review the last Daily Vehicle Inspection Report (DVIR)
- ensure they are properly licensed to operate the vehicle

If defects or deficiencies were noted by the previous driver on the DVIR, the current driver shall sign the DVIR to acknowledge they have seen the previous service record, or that the defects or deficiencies do not require immediate correction. (This requirement for a signature does not apply to listed defects on a towed unit which is no longer part of the vehicle combination.)

At the completion of the driver's use of the vehicle the driver is to complete the DVIR.

If a defect is identified during vehicle operation, record it on the Trip Inspection form and:

- if the defect is major (i.e., anything affecting the safe operation of the vehicle), report immediately to the direct supervisor
- if the defect is minor (i.e. anything not directly affecting the safe operation of the vehicle), report in a timely manner to supervisor, e.g., at end of work shift or at beginning of next work shift

No CMV or other assigned vehicle is permitted to be driven until major defects have been repaired or corrected.

CMV drivers shall prepare a daily written post-Trip Inspection report at the end of each driving day. Every driver is responsible for preparing such a report for each vehicle driven.

The report shall list any condition that the driver either found or had reported to them that would affect safety of operation or cause a breakdown. If no defect or deficiency is reported or found, the report shall state this. The driver shall sign the report in all cases.

Each Region shall have a system of records that tracks the inspection, maintenance and repair history for each of owned or leased CMV. The records shall be written or electronic (such as Maximo).

Every CMV or segment of a combination vehicle requires periodic inspection by a Qualified individual at least once every 12 months. This inspection shall meet the Minimum Periodic Inspection Standards outlined by the Department of Transportation. Documentation of the most recent periodic inspection shall be kept on or in the vehicle and at the maintenance facility for a period of 14 months.

Drivers Carrying Cargo

Drivers carrying cargo shall:

- ensure that all cargo transported inside and on a CMV is contained, immobilized or secured according to all Applicable Legislation; training in this area is required for anyone driving a CMV
- drivers shall not use any vehicle to transport material unless the vehicle is constructed to carry the material and the vehicle is capable of being safely operated when loaded
- inspect the cargo and its securing devices within the first 50 miles after beginning a trip and re-inspect when there is a change of duty status, after driving 3 hours, and after driving 150 miles

Hours of Service

Drivers shall abide by the following Hours of Service (HOS) rules.

11-hour rule

- drivers are allowed to drive for 11 hours following 10 consecutive hours off duty

14-hour rule

- a driver is not permitted to drive after 14 hours of work duty (including driving and other duties) after coming on duty following 10 consecutive hours off duty

60-hour rule

- a driver is not permitted to drive after a total of 60 hours on duty in 7 consecutive days

70-hour rule

- a driver is not permitted to drive after a total of 70 hours on duty in 8 consecutive days

An off duty period of 34 or more consecutive hours may restart a driver's 7 or 8 consecutive day period as long as the driver has not exceeded 60 or 70 hours on duty.

If using CMVs exclusively in the transportation of oilfield equipment, including the stringing and picking up of pipe used in pipelines, and servicing of the field operation of the natural gas and oil industry, and period of 8 consecutive days may end with the beginning of any off-duty period of 24 or more consecutive hours. Other exceptions are found in the Applicable Legislation.

Written Records and Daily Logs

Every CMV driver shall prepare a written record of duty status (e.g., daily log book/e-logbook, timesheet or other appropriate means of tracking), in duplicate, for each 24-hour period, unless falling under the exemptions listed in Applicable Legislation.

Every driver shall keep their activities current by showing each change in duty status, recorded as:

- "Off duty" or "OFF"
- "Driving" or "D"

- “On-duty not driving” or “ON”

Driver’s shall retain a copy of their written record of duty status for 8 days, and shall submit the original copy within 13 days of completion. The time zone used on a driver’s daily log shall be the time standard of that driver’s home terminal.

Operations CMV drivers shall submit the written record of duty status to their regional CMV representative.

Time Records shall show the following:

- the time the driver reports for duty each day
- the total number of hours the driver is on duty each day
- the time the driver is released from duty each day
- the total time for the preceding 7 days
- payroll timesheets from HR

An employee shall not operate a CMV unless they are medically certified as physically qualified. When on-duty the driver shall have in their possession a current medical examiner’s certificate (original or copy) that states they are physically qualified to drive a CMV.

If a driver incurs a Department of Transportation (DOT) violation while driving a CMV, whether it has a monetary fine or not, the driver’s People Leader shall be notified immediately and this information shall be forwarded to the CMV representative within 24 hours.

12.7 **Powered Mobile Elevating Work Platforms**

Powered Mobile Elevating Work Platforms with articulating boom and extended boom platforms shall be operated by trained, authorized and Qualified operators.

Operators shall be given oral and written instructions prior to the first use of such platforms.

The training shall include:

- load limitations and securement
- manufacturers’ requirements
- hands-on demonstration of the controls
- hazard mitigation knowledge

Operators shall document daily checks on each Powered Mobile Elevating Work Platform before use.

Powered Mobile Elevating Work Platforms shall:

- have easily reachable upper (platform) and lower controls, with their functions clearly marked and tested each day prior to use
- lower controls that are capable of overriding the upper controls (lower controls shall only be operated in an emergency, unless the Worker in the lift has given permission)
- only be used on a firm, level surface with the brakes set and outriggers positioned on pads or a solid surface; use wheel chocks when on an incline
- have the load rating posted (load rating shall not be exceeded)

- have platforms that meet manufacturers' specifications and is designed and certified by a certified professional engineer
- have an anchor point specified by the manufacturer
- Be inspected by a Qualified person as required by manufacturers specifications and Applicable Legislation

Powered Mobile Elevating Work Platforms shall not:

- be used for anything other than lifting Workers, tools and materials to an aerial Worksite
- be used as a crane or hoist
- have loads placed or carried outside the platform perimeter

When in an elevated working platform on mobile equipment, Workers shall:

- use a travel restraint system consisting of a full body harness and lanyard connected to an anchor point specified by the manufacturer
- have lanyards short enough to prevent the Worker from being ejected from the work platform or aerial device but long enough to allow the Worker to perform their work
- tie off to the attachment point at all times when elevated, including when entering, exiting or maneuvering
- climb in or out through a doorway
- not stand on rails or objects inside the platform
- not tie off to an adjacent pole, structure, or equipment while working from the platform

12.8 **Powered Mobile Equipment**

Powered Mobile Equipment shall:

- have seatbelts
- be equipped with engineered ROPS
- have manufacturer-installed horns that are functional
- have audible, functional back-up alarms
- have all required lighting and the lighting shall be functional
- have fire suppression equipment suitable to the conditions and hazards

Powered Mobile Equipment operators shall complete training in the safe operation of the equipment to which they are assigned, and shall have their competency confirmed and documented by a People Leader.

Workers, other than the designated operator, shall not operate Powered Mobile Equipment unless authorized by the People Leader in charge. The operator of the equipment is responsible for the safe operation and movement of the vehicle.

Workers operating Powered Mobile Equipment shall:

- wear seatbelts when operating Powered Mobile Equipment
- use standard horn signals for Powered Mobile Equipment
- ensure lighting is functional and used as necessary
- comply with all Site traffic control plans
- wear HVSA (HSVA may be removed by the Worker when enclosed in the cab of the equipment)
- not use communication devices or allow other distractions during operation
- not climb Powered Mobile Equipment while in motion

- not allow others to climb Powered Mobile Equipment while in motion
- not allow other Workers to ride on Powered Mobile Equipment, except in the seats provided (ensuring that all passengers wear seatbelts)

In addition, Workers working with or around Powered Mobile Equipment shall ensure:

- mats are not stacked higher than the side boards on forwarders used to haul mats
- cable guards are used when working on tractors and other equipment with a winch to protect from the danger of flying cables
- keys are removed and equipment locked when daily work activities are completed
- 3 points of contact are used whenever entering, exiting, or climbing ladders/designated points of access on equipment
- maintain adequate separation from all above and Below Grade Facilities

Prior to operating Powered Mobile Equipment, the operator shall:

- document a pre-use inspection
- ensure all loose objects are secured
- conduct a circle check of the equipment for:
    - potential obstructions and approach distances
    - fluids on, or under, the equipment
    - equipment damage
- be completely familiar with all of the following:
    - controls, indicators and warning lights
    - caution, warning and danger decals affixed to the equipment
    - limits of the equipment
    - equipment blind spots

In addition, the operator shall:

- be cautious when rotating the cab or when maneuvering through tight spots
- be cautious when entering/exiting buildings
- be cautious when reversing and use a Signaler/Spotter when vision is obscured or when required by the Hazard Assessment
- limit equipment use in congested work zones unless a clear work plan is established and communicated to affected Workers
- adhere to the manufacturer' recommendations for the safe movement of Powered Mobile Equipment
- adhere to the capacity ratings during operation of Powered Mobile Equipment
- make the unit inoperative and ensure it is in a safe state prior to exiting the equipment

Powered Mobile Equipment shall be inspected for the following:

- proper adjustment of operating mechanisms
- excessive wear or deterioration of components and accessories (e.g., cranes, boom pins, sheave blocks)
- damage that prohibits the safe operation of the equipment

Inspect hydraulic hoses, fittings and tubing (particularly hoses that flex in normal operation) for the following:

- leaks at threaded or clamped joints
- leaks at the surface of flexible hose
- blistering of hoses
- abrasion or scrubbing on the outer surface of hoses, tubing and fittings

Hydraulic relief valve settings shall never exceed specified pressure.

Tracked Equipment

All tracked equipment shall be equipped with cleats or grouser bars to ensure maximum traction in frozen conditions. This also applies when mud or loose terrain is a concern and slippage is a potential risk based on a Hazard Assessment.

Traction aids may be applied after equipment is walked onto a site, provided a prior assessment of access has been completed to address any concerns. Traction aids shall be in place prior to any excavation activity.

Ditching Machines

Follow these requirements related to ditching machines:

- do not undertake wiping, oiling, adjusting or repair while any part of the machine is in motion
- an Oiler or Serviceman may carry out oiling and greasing with only the power unit left running, but only if done under the direction of an operator who remains at the controls of the ditching machine
- when adjustments or repairs are necessary, all power units shall be shutdown before starting work on the adjustments or repairs
- where the operator is required to carry out any of the above-mentioned functions unassisted, all power units shall be shutdown before leaving the controls
- no ditching machine shall be operated unless the machine guards are installed and properly maintained
- the ditching machine operators shall keep their helpers in sight or know where they are at all times
- do not undertake manual cleaning of buckets when the digging wheel is in operation
- operators and helpers shall not climb on the ditching machine while it is in motion
- the operator shall not leave the controls of the machine unless the main transmission and digging wheel are out of gear and the traveling brakes set

12.9 All Terrain and Off Road Vehicles

Workers operating All-Terrain Vehicles (ATV), Utility-Terrain Vehicles (UTV) and Snowmobiles shall be trained and Qualified in their use and authorized to operate the vehicle.

Operators shall:

- wear Snell/DOT approved helmets when the vehicle is not equipped with a ROPS and seatbelts with shoulder restraints
- wear appropriate PPE, e.g., protective goggles and/or other suitable devices to prevent eye and face injuries from twigs, flying debris and weather conditions
- wear a high visibility outer vest at all times when the vehicle does not have ROPS
- wear seatbelts when the vehicles safety system is designed for seat belt use

All ATVs, UTVs and Snowmobiles shall:

- be inspected prior to use

- be registered and insured with such documents carried on the equipment
- have license plates securely attached in a visible location, as required by Applicable Legislation
- receive permission prior to operation on private property
- be operated at speeds appropriate for the terrain, visibility, conditions and experience
- be equipped with an aerial whip and flag, First Aid kit, 5 lb. ABC fire extinguisher, plus portable communication equipment as required (e.g. hand-held radio, cellular or satellite phone)
- have an emergency kit depending on the conditions and use as required by the Hazard Assessment

UTV's and Snowmobiles may only carry passengers when there is a passenger seat. Seat belts shall be worn by passengers when the vehicle safety system is designed for their use.

12.10 Aircraft

The pilot is responsible for all aspects of the flight, including passenger safety.

Passengers (Enbridge Employees and Contractor personnel) are encouraged to take responsibility for their own safety and seek clarification of safety information where necessary.

Helicopters (including those involved in slinging operations) shall be operated with a 5% power reserve. Pilots may reduce the 5% power reserve only in ideal flight conditions; if a lesser reserve is used, it shall guarantee adequate power for an abort in the event of changing flight conditions. However, the pilot shall maintain some power reserve.

Workers working around helicopters during slinging operations shall:

- keep the area free of loose articles
- watch for hazards, such as obstacles or hanging trees that may fall when dislodged by the helicopter rotors or by gusty wind conditions
- stay alert and be aware of the positioning of loads
- maintain visual contact with the load (and cargo hooks) until it clears the location
- keep a safe distance from the loads
- remain clear of incoming loads (and cargo hooks) until they are placed on the ground
- determine an escape route that leads away from the load, and ensure it remains clear of objects or potential blockages
- always stand uphill from the load, as it may roll when released
- maneuver the load only when absolutely necessary and only by pushing it into position; do not reach for a load or cargo hook

For slinging (long-line) operations, follow these requirements:

- use only multi-stranded steel core long lines, cables or lanyards
- use long lines and lanyards swaged with steel; do not use cable clamps
- attach only properly-sized clevises to the helicopter hook (either the belly hook or the extended hook) and keep all screw-type clevis pins tight and lock-wired
- use only the proper type of clevis pins (not bolts) and check clevises before and after each lift

- complete record of inspection and log books
- secure loads of loose articles in cargo nets
- advise the pilot of the presence of any hazardous materials
- do not conduct long line operations over populated areas
- do not conduct long line operations within 100 m (110 yd.) of high-voltage power lines
- cease operations during electrical storms
- ground all loads to prevent a buildup of static electricity (static prevention is meant to prevent possible electrical injury to Spotters)

Before commencing slinging operations, designate one person as spotter and ensure that radio frequencies are established.

The Spotter is the only person permitted to stand beneath the helicopter during slinging operations, unless another person is required to help position the load.

The Spotter is the only person permitted to use hand signals.

The Spotter shall:

- use standard hand signals when the helicopter is operating directly overhead and when it is impossible to use radio communication
- confirm that the pilot has visual contact of the Spotter by radio prior to using hand signals
- ensure standard helicopter hand signals are practiced prior to the start of operations; this ensures signals are agreed upon and understood by both the pilot and spotter (See Figure 1)
- use large movements when using hand signals, especially when using long lines this is necessary because the pilot may be as high as 45 m (150 ft.) above the Spotter)

In addition to wearing basic PPE, the Spotter shall also wear the following PPE at all times during slinging operations:

- head protection with chin strap
- protection from static (e.g., high-voltage gloves) during cold weather/low humidity
- HVSA

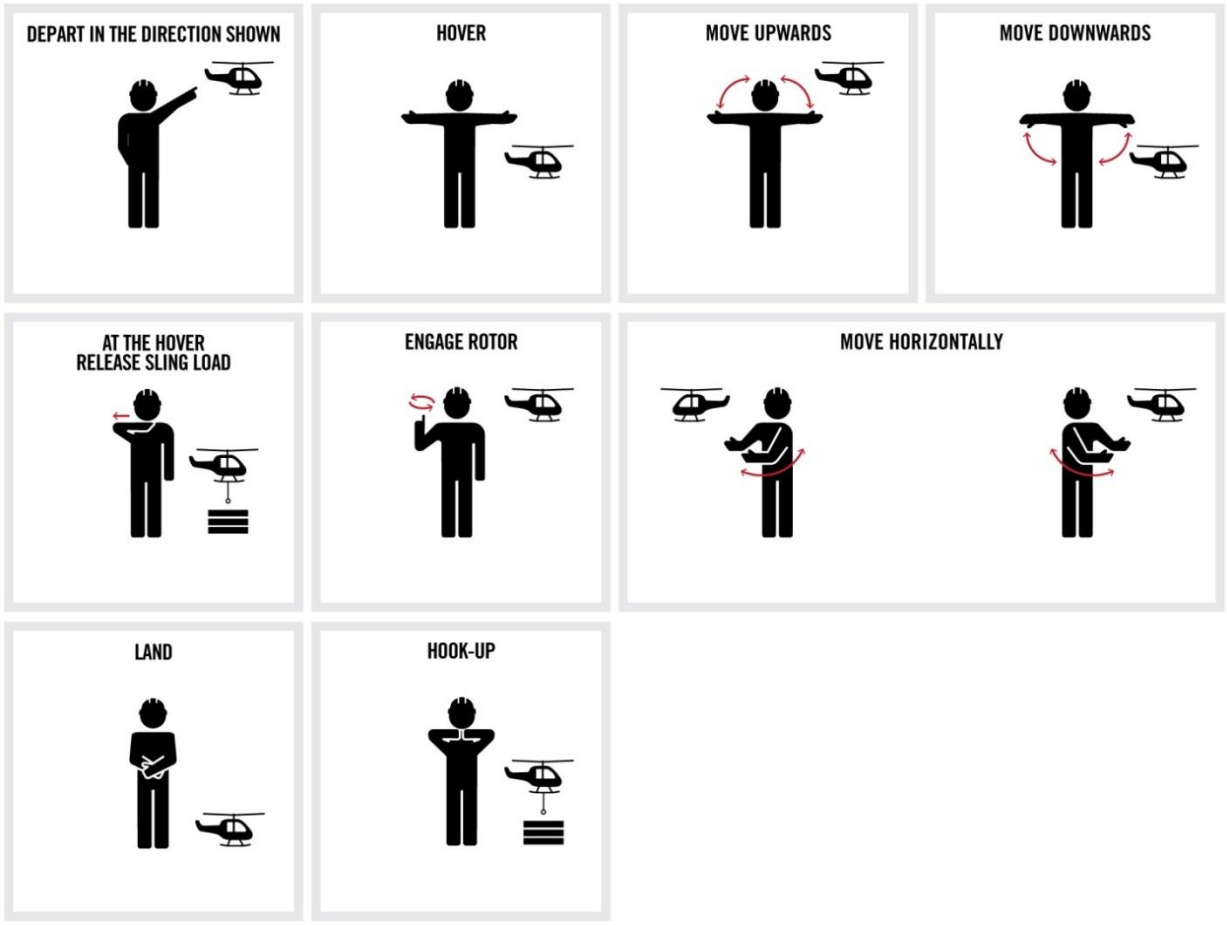


Figure 1- Helicopter Hand Signals

12.11 Signalers and Spotters

Signalers/Spotters shall be used when:

- parts of the work area could potentially be obscured
- vehicle/equipment is backing up or moving, and the operator cannot see all parts of the machine/vehicle and its path of travel
- vehicle/equipment is backing up or moving in congested areas
- vehicle/equipment make turns with restrictive side clearances
- equipment or parts of equipment encroach on the safe limits of approach (e.g. overhead power lines and communication lines)
- movement of vehicle/equipment may result in the operator and/or other Workers being exposed to additional hazards
- excavating
- conducting helicopter singling operations

The Signaler shall:

- stop vehicles/equipment from backing up when hazards are observed, and inform operators and Workers of people entering the immediate work area
- communicate with the operator, either verbally or through standard/material lifting hand signals (see Figures 1 and 2)
- ensure there are no hazards present that might endanger a Worker
- alert Workers to any hazards that arise while material is being moved when the view of the operator is obscured

- establish and maintain eye contact with the operator
- remain clearly visible to the operator at all times
- stand far enough behind, or in front of, the equipment to observe the positioning/backing path and any obstructions, and to allow for sufficient stopping distance in an emergency
- stay clear of the vehicle's blind spots or line of fire and avoid walking backward
- be clearly identified, distinguishable from other Workers, by wearing, at a minimum, Class 2 HVSA
- complete any prescribed training required by Applicable Legislation in the jurisdiction where the signaler is performing signaling duties

Standard signals shall:

- be used by the Signaler/Spotter when directing vehicles or equipment
- be agreed upon and understood by both the operator and signaler/spotter prior to moving vehicle/equipment

The operator shall take direction from only one Signaler. However, anyone can give a **STOP** signal and the operator and/or Spotter shall comply.

Communication between the operator and spotter shall be maintained. If the ability to transmit signals is interrupted at any time, the operator shall safely stop operations requiring signals until communication is reestablished and a proper signal is given and understood. If eye contact is not possible, a lift plan shall be developed.

If electronic communication is required, then that equipment shall be tested on-site before beginning operations to ensure that the signal is effective, clear and reliable.

PROCEED SLOWLY FORWARD
Always face palms in direction of desired travel
PROCEED SLOWLY BACKWARD
Then bend both arms repeatedly forward head and chest, and then extend
CLEAR TO LEAVE THE AREA
Point at the driver, and gain eye contact
Turn and extend arms in desired direction
TURNS
Point one arm to indicate the direction to turn. Bend monitoring arm repeatedly toward head to indicate continued turning.
EMERGENCY STOP
Start with hands clasped over head. Extend downward repeatedly until vehicle stops.
DISTANCE TO STOPPING POINT
Face palms forward, with hands above head. Bring elbows forward and hands together.
STOP
Cross both arms above head.

Figure 1- Standard Hand Signals

HOIST
With right arm vertical, forefinger pointing up, move hand in small horizontal circle
LOWER
With arm extended downward, forefinger pointing down move hand in small horizontal circle
USE MAIN HOIST
Tap fist on head, then use regular hand signals
SWING
Arm extended, point with finger in direction of swing of boom
STOP
Arm extended, palm down move arm back and forth horizontally
EMERGENCY STOP
Both arms extended, palms down, move arms back and forth horizontally
USE WHIP LINE
Auxiliary Hoist
Tap elbows with one hand; then use regular signals
RAISE BOOM
Arm extended, fingers closed, thumb pointing upward
LOWER BOOM
Arm extended, fingers closed, thumb pointing downward
TRAVEL
Arm extended forward, hand open and slightly raised make pushing motion in direction of travel
DOG EVERYTHING
Grasp hand in front of body
TRAVEL BOTH TRACKS
Use both fists in front of body making a circular motion about each other indicating direction of travel forward or backward
TRAVEL ONE TRACK
Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of fist rotated vertically in front
EXTEND BOOM
Both fists in front of body with thumbs pointing outward
RETRACT BOOM
Both fists in front of body with thumbs pointing towards each other
MOVE SLOWLY
Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal
RAISE THE BOOM AND LOWER LOAD
With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired
LOWER THE BOOM AND RAISE LOAD
With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired
EXTEND BOOM (ONE HAND)
One fist in front of chest with thumb tapping chest
RETRACT BOOM (ONE HAND)
One fist in front of chest with thumb pointing outward and heel of hand tapping chest

Figure 2 - Material Lifting Hand Signals

13.0 Electrical Safety Standard

Under normal operating conditions, only Qualified Electrical Workers wearing proper PPE and using proper equipment shall perform construction, testing, repair and maintenance on electrical equipment with or without Hazard Risk Category (HRC) labels.

Unless it is not practical, all circuits shall be set or placed in an energy-free, safe work condition (LOTO procedures shall be used) before a Qualified Electrical Worker performs construction, testing, repair, or maintenance.

Before any work proceeds in relation to energized conductors or circuits, the hazards of the work shall be identified and controlled through the Hazard Assessment process, including an Electrical Hazard Analysis if required. All identified hazards and controls shall be notated in the Hazard Assessment and the SWP, as appropriate.

When non-qualified Workers are assigned to work with Qualified Electrical Workers they shall be instructed by Qualified Electrical Workers in safety precautions, work procedures, and electrical hazards in the work area. Non-qualified Workers are not permitted to work within the Limited Approach Boundary of exposed electrical conductors or circuit parts, unless special precautions are followed, as identified in this Standard.

Pipelines and Induced Voltage

Prior to any work on exposed pipelines, the pipeline shall be tested for induced voltage by a Qualified Worker. Induced voltage cannot exceed 15V.

A Qualified Electrical Worker shall take specific measures identified in this manual to bond and ground exposed pipelines to bleed off any charge in excess of 15V; the Qualified Worker shall then monitor the charge level to ensure it remains below 15V.

Energized Substations

Before starting work on energized substations, Workers (e.g., a Qualified Electrical Worker or a Supervisor) shall notify the appropriate utility companies.

For electrical work on equipment within energized substations, follow these requirements:

- ensure Qualified Electrical Workers directly supervise non-qualified electrical Workers and maintain line of sight
- ensure no Worker works alone
- ensure no person enters the barricaded area without the approval
- ensure a Hazard Assessment is completed and a safe work plan developed
- use Safety Watches as specified in the Hazard Assessment and SWP
- erect self-standing, non-conductive barricades at the exterior of the substation to adequately protect non-electrical Workers from the hazards within the substation
- attach markings (e.g., ribbon) to the barricades for increased visibility to all Workers
- do not use ribbons or other such materials as a means to support barricades

- ensure that if the substation fence is removed, a temporary fence of equal height is installed

To maintain a safe clearance from the substation grounding system, all construction equipment (such as work trailers and supplies) shall be stored a minimum of 3 m (10 ft.) outside of the substation fence.

13.1 Limited Approach Boundaries

Enbridge Workers shall maintain the Limited Approach Boundaries outlined in Table 1. These boundaries apply to Workers as noted, including their work involving tools, vehicles or equipment.

Also refer to the Limited Approach Boundaries for overhead power lines, and related requirements provided at the end of this section.

A Qualified Spotter shall ensure the minimum safe distances (i.e., Limited Approach Boundaries, sometimes referred to as safe limits of approach) are maintained by all Workers and equipment in the area. As part of this duty, the Qualified Spotter shall monitor movements of all Workers, tools and equipment when work is in progress near energized lines.

Table 1- Limited Approach Boundaries

Voltage of Power Line or Conductor		Minimum Safe Limited Approach Boundary	
Phase to Ground AC Voltage	**Phase to Phase AC Voltage**	**Non-Qualified Workers**	**Qualified Electrical Workers**
425–12,000	735–20,780	3.0 m (10 ft.)	0.9 m (3 ft.)
12,000–22,000	20,780–38,105	3.0 m (10 ft.)	1.2 m (4 ft.)
22,000–50,000	38,105–86,600	3.0 m (10 ft.)	1.5 m (5 ft.)
50,000–90,000	86,600–155,880	4.5 m (15 ft.)	1.8 m (6 ft.)
90,000–120,000	155,880–207,845	4.5 m (15 ft.)	2.1 m (7 ft.)
120,000–150,000	207,845–259,805	6.0 m (20 ft.)	2.7 m (9 ft.)
150,000–250,000	259,805–433,010	6.0 m (20 ft.)	3.3 m (11 ft.)
250,000–300,000	433,010–519,615	7.5 m (25 ft.)	3.9 m (13 ft.)
300,000–350,000	519,615–606,215	7.5 m (25 ft.)	4.5 m (15 ft.)
350,000–400,000	606,215–692,820	9.0 m (30 ft.)	5.4 m (18 ft.)

Electrical Hazard Analysis

Arc flash risk assessment and shock risk assessment shall be performed as per CSA Z462 (Canada) and NFPA 70E (U.S.).

The HRC label shall identify the hazard/risk category and the minimum requirements for PPE (see Figure 1 for a sample label).

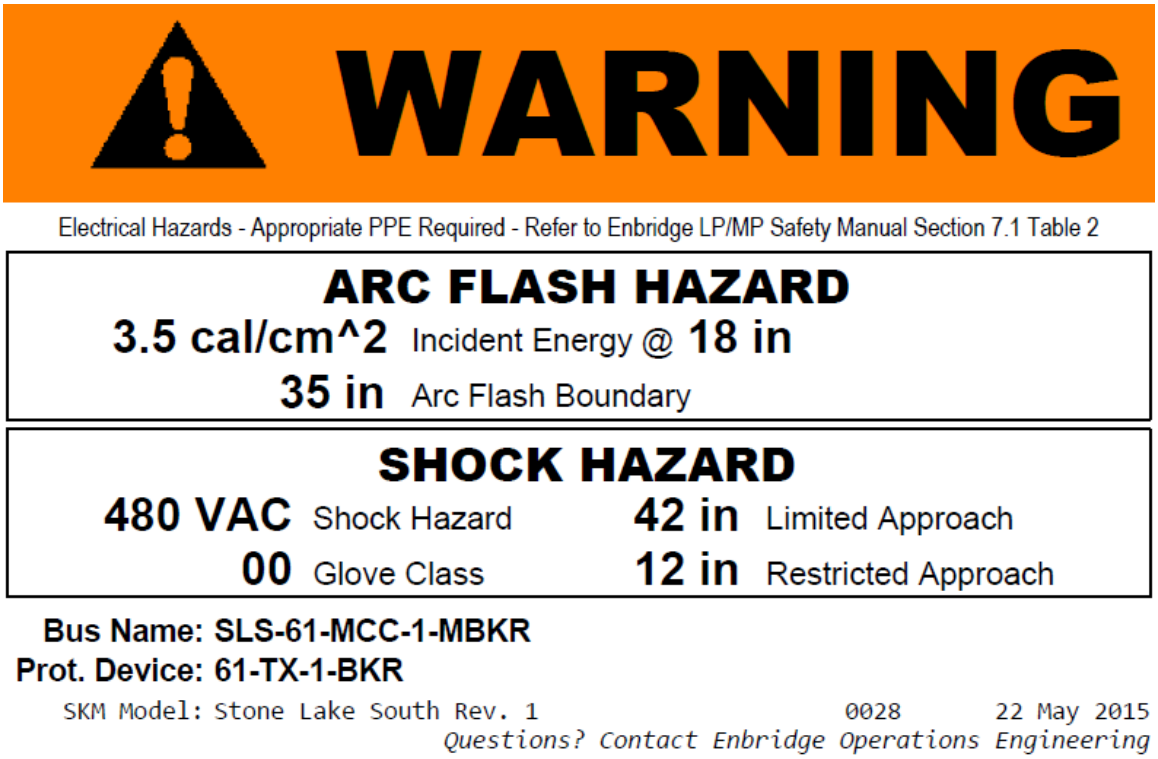

WARNING
Electrical Hazards - Appropriate PPE Required - Refer to Enbridge LP/MP Safety Manual Section 7.1 Table 2
ARC FLASH HAZARD
3.5 cal/cm^2 Incident Energy @ 18 in
35 in Arc Flash Boundary
SHOCK HAZARD
480 VAC Shock Hazard
00 Glove Class
42 in Limited Approach
12 in Restricted Approach
Bus Name: SLS-61-MCC-1-MBKR
Prot. Device: 61-TX-1-BKR
SKM Model: Stone Lake South Rev. 1 0028 22 May 2015
Questions? Contact Enbridge Operations Engineering

Figure 1 – Sample HRC Label

Non-qualified Workers shall not be permitted to approach within the Limited Approach Boundary for energized conductors and circuit parts unless a Qualified Electrical Worker advises them of the possible hazards and continuously escorts them while inside the boundary.

Non-qualified Workers shall not be allowed within the restricted approach boundary.

Hazard/risk categories for various tasks include, but are not limited to:

- performing infrared thermography or other non-contact inspections
- Circuit Breaker (CB) or fused operation with covers on
- CB or fused operation with covers off
- work on energized electrical conductors and circuit parts, including voltage testing
- removal/installation of CBs or fused switches
- removal of bolted covers
- opening of hinged covers
- work on energized electrical conductors and circuit parts of utilization equipment fed by a branch circuit of the panel board
- reading a panel meter while operating a meter switch
- insertion or removal of starter “buckets” from MCC
- application of safety grounds, after voltage test
- insertion/removal (racking) of CBs from cubicles, whether doors are open or closed

Workers shall consult their People Leader if the HRC of a given task is unclear or unknown, e.g., if equipment is not clearly labeled or other factors are unknown.

Where a Qualified Electrical Worker cannot maintain a Limited Approach Boundary and cannot de-energize lines and conductors, then an Electrical Hazard Analysis shall be conducted and written work procedures developed. In such cases, a Qualified Electrical Worker shall be designated as Safety Watch and, in accordance with the procedures; the Qualified Electrical Workers doing the work shall use appropriate PPE and insulated tools rated for the voltage.

To safely route Workers, equipment or objects under power lines or energized conductors, the minimum distance may be reduced under the direction of a Qualified Electrical Worker; however, the clearances for Workers, equipment or objects shall remain constant.

Overhead Power Lines

Workers shall not place themselves or operate equipment within the Limited Approach Boundary of overhead power lines. As shown in Table 1, the Limited Approach Boundary is 3 m (10 ft.) for systems up to 50 kV, and an additional 100mm (4 in.) for every 10kV above 50kV.

For work within 6 m (20 ft.) of the Limited Approach Boundary of overhead power lines (see Figure 1), follow these requirements:

- Site orientations, pre-job meetings, and daily tailgate meetings shall discuss assessed hazards, SWPs and location(s) of the overhead power lines.
- Workers shall be informed of the identified hazards and any control measures or precautions, in accordance with the Hazard Assessment.
- A Qualified Spotter shall be used when Workers and/or equipment are in proximity to the Limited Approach Boundary.
- Delivery truck operators shall be cautioned about any overhead power lines present, and a Qualified Spotter shall assist with loading or unloading operations (as appropriate, other vehicle operators shall be similarly cautioned, e.g., high vehicles)
- Warning decals shall be posted on cranes and similar equipment, regarding the 3 m (10 ft.) minimum clearance.
- Delivery or other vehicles that have emptied their material (e.g., dump trucks) shall not be permitted to leave the work location until the boom, lift or box is down and safely secured.
- Vehicles with loads higher than 4.3 m (14 ft.) shall follow specific procedures to maintain safe working clearances when in transit below overhead power lines.
- Warning cones/goal posts shall be used as visible indicators of the 3 m (10 ft.) Limited Approach Boundary. A safe work area shall be established before work commences. (See Figure 2)
- If overhead power line voltages are unknown, a Qualified Electrical Worker shall determine the voltages and the Limited Approach Boundary, and shall take appropriate action to make the work area safe

When isolating third party electricity crossings ensure that verification of isolation is carried out by a Qualified Electrical Worker.

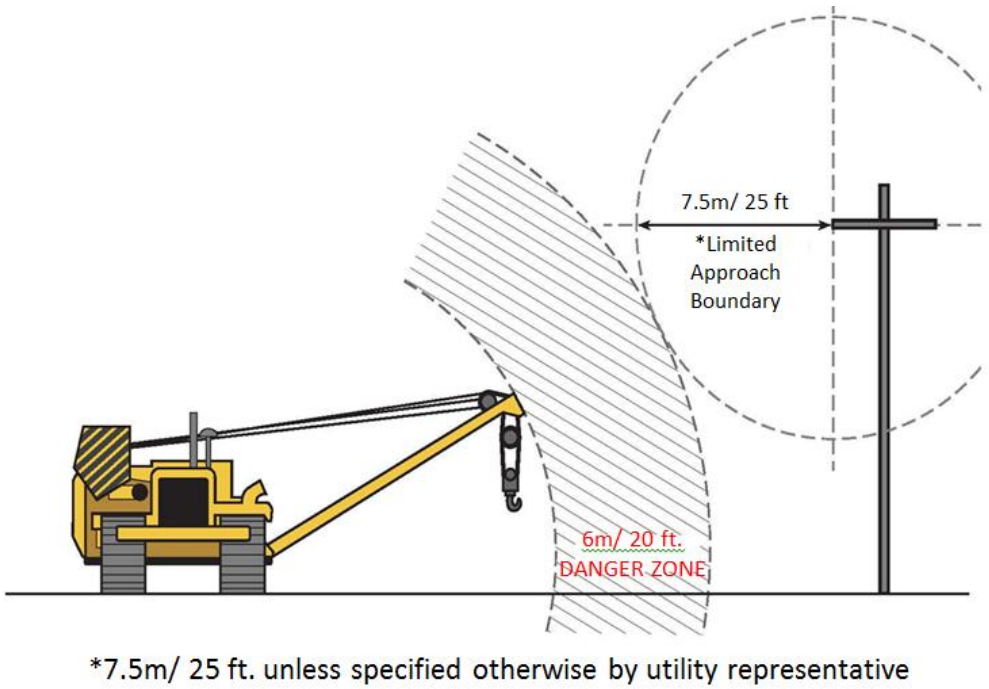


Figure 1 – Signage and Signaler required when Danger zone encroaches on Limited Approach Boundary

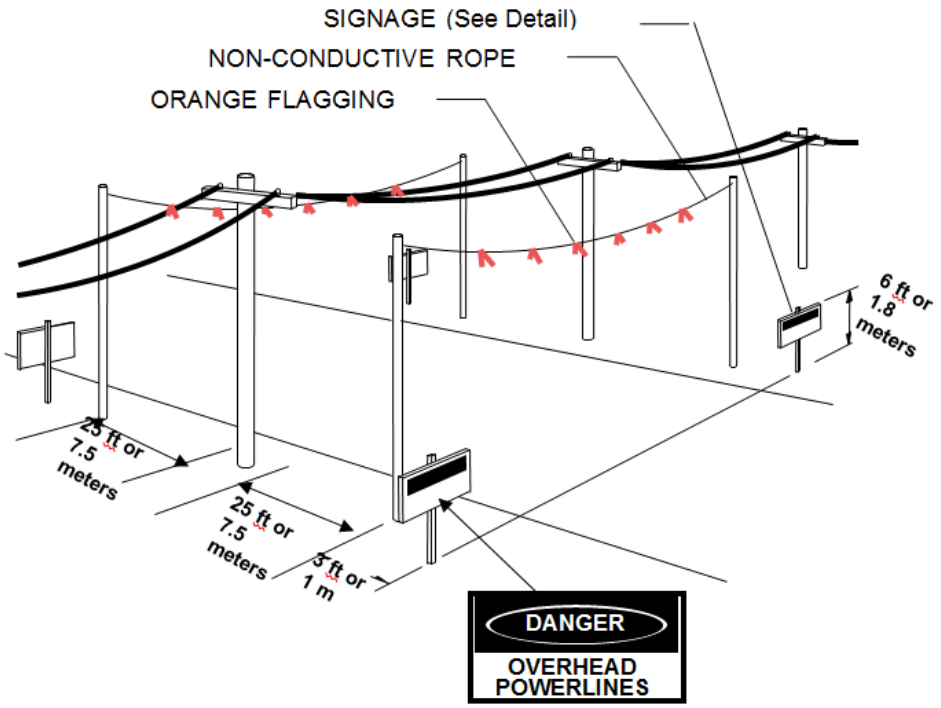


Figure 2- Typical Goal post setup

13.2 **High Voltage**

When a Qualified Electrical Worker is not available, a non-electrical Worker (e.g., mechanical, PLM, Operations) may be allowed to rack in or out a 5 kV mainline unit, or booster pump breakers or contacts, if:

- the HRC label on the electrical equipment is clear, and the HRC is not higher than 2
- the current written operating procedure for racking the breaker in and out is readily available on-site, and is reviewed by the non-electrical Worker
- the non-electrical Worker:
    - wears the proper PPE for the HRC level identified on an arc flash label;
    - has been trained to complete the specific electrical work and the Worker's training is documented; and
    - there is a refresher training timeline identified for the Worker that is recorded within the training tracking system

Use the Electrical Equipment Isolation/Clearance Form for:

- high voltage work
- work upstream of the 480 V main breaker

Completion of the Electrical Equipment Isolation/Clearance Form is not required for activities such as racking out a breaker and/or disabling a vacuum contactor for mechanical maintenance (e.g., seal changes).

Use an adequately-rated and tested hot stick for installing or removing safety ground cables to high voltage equipment and conductors.

13.3 **Low Voltage**

A non-electrical Worker (e.g., mechanical, PLM, operations, cathodic protection and other contract personnel) is authorized to perform certain tasks provided:

- the HRC label on the equipment indicates the HRC is not higher than 2
- the Worker wears the proper PPE for the HRC identified
- the Worker has been trained to complete the specific electrical work and the Worker's training is documented; and
- there is a refresher training timeline identified for the Worker that is recorded within the training tracking system

The authorized low voltage tasks include:

- turn on and off branch circuit breakers less than or equal to (≤) 600 V
- reset circuit panel breakers once, if voltage is less than or equal to (≤) 240 V
    - if a circuit panel breaker trips again after resetting once, the non-electrical Worker shall contact a Qualified Electrical Worker
    - if a circuit's condition is suspect or has sustained damage, the non-electrical Worker shall contact a Qualified Electrical Worker for appropriate testing prior to resetting

Test all ground fault breakers and Ground Fault Interrupter (GFI) receptacles in accordance with the manufacturer's instructions.

13.4 **Exposed Electrical Equipment/Conductors**

Workers working on or near exposed electrical conductors or circuits that are energized, or can become energized shall:

- not assume an electrical conductor is de-energized
- not make body contact or reach blindly into un-insulated equipment or conductors until:
    - visibly isolated from the power supply and locked out
    - voltage tested and confirmed to be absent of potential energy (i.e., de-energized)
    - for high voltage equipment/conductors, potential energy sources are safety grounded
- use required PPE when testing for high voltage
- when verifying the absence of potential, use a voltage detector or tester designed to meet or exceed the system voltage to be tested
- not perform electrical work, other than hot stick work, on energized high-voltage conductors

Safety grounds on distribution lines and equipment may be temporarily removed during voltage tests.

14.0 Hazardous Materials Standard

Contact the Environmental department to assist with any spill, leak or potential contamination of hazardous materials. Refer to the Waste Management Plan for information on proper disposal of Hazardous Material.

14.1 Characteristics of Products Transported by Pipeline

Enbridge's pipeline system transports various non-refined, synthetic, semi-refined or refined hydrocarbon liquids and natural gas liquids.

All products transported by pipeline shall be considered toxic and flammable volatile hydrocarbon liquids. All of these liquids are under pressure when the system is operating.

Vapors and gases released by these liquids:

- may create breathing hazards, as well as fire and explosion hazards
- are heavier than air, and will accumulate in buildings, Confined Spaces, and low areas such as pits, Excavations, bermed areas and natural depressions in the ground

The primary breathing hazards associated with the pipeline products being pumped include petroleum vapors, benzene vapors and H_2S gas

H_2S at levels of 100 ppm (IDLH) or more may be present in crude oils and condensates classified as sweet or sour.

Workers are at greatest risk of being exposed to these types of vapors and gases when working around free or released product and Open Systems. The risk of exposure also exists when working in Hazardous Areas and Restricted Areas.

- Respiratory, fire and explosion hazards have the potential to exist around spills and Open Systems until the area or system is free of liquid and determined to be isolated and gas-free
- Gas detection is required to verify a safe atmosphere. Appropriate RPE shall be worn, as specified in job-specific procedures, and as required based on the results of Atmospheric Monitoring.

Natural Gas Liquids (NGLs)

NGLs contain propane, butane and condensates such as heptane, hexane and pentane.

NGLs are considered to be the most hazardous of the products transported by pipeline.

When released into the atmosphere, NGLs may look like a steam cloud close to the source. NGLs are extremely cold, with a boiling point of -42°C (-44°F).

NGL vapour may smell something like gasoline, and may have a narcotic and intoxicating effect which could lead to unconsciousness.

Since NGLs are extremely flammable, all ignition sources shall be eliminated.

Diluent

Like most petroleum, diluent is flammable and contains volatile substances in varying percentages. The lighter hydrocarbons included in diluent are typically naphtha, benzene and pentane

As with other pipeline liquids, keep ignition sources away from diluents.

In the event of a release, use RPE as required.

14.2 Storage and Transportation

Follow labeling regulations as required by pipeline regulatory agencies.

Labels are required to be displayed:

- on the pipeline system, and
- on breakout tanks

Employees shall receive orientation and training on the hazards associated with the various products transported by pipeline or stored, including non-refined, synthetic, semi-refined or refined hydrocarbon liquids and natural gas liquids.

Label permanent containers of hazardous materials with the following:

- product name
- hazardous ingredients
- hazard warnings
- manufacturer's name
- a reference to the applicable Safety Data Sheets (SDS)

Label temporary containers of hazardous materials with the following:

- product name
- hazard warnings
- a reference to the applicable SDS

If a label is missing or illegible, it should be replaced with a Workplace Label.

Containers with Benzene

Containers with benzene content more than 0.1% by volume shall be labeled as follows:

- "Danger: contains benzene, cancer hazard"

Intact pipe or intact, sealed containers that contain benzene vapors or liquid do not require this additional warning label.

Storage

Store containers of hazardous materials in a protected area as follows:

- indoors (whenever possible)
- away from equipment and vehicle routes
- away from moisture and excessive heat
- on an impervious surface with containment capabilities (e.g., dikes, curbs); or if not available, on an impermeable containment structure (e.g., tray, containment pallet, tote)

All containers shall be inspected regularly to ensure containment.

If hazardous materials are stored in drums at a site, a hazardous materials spill kit shall be available at the site.

Maximum Quantities (Storage)

The total maximum quantity of flammable liquids and combustible liquids stored outside a storage cabinet shall not exceed:

- In Canada- 600 L (158 gal), of which not more than 100 L (26 gal) may be flammable liquids
- In the USA- 500 L (120 gal), of which not more than 250 L (60 gal) may be flammable liquids

The total maximum quantity of flammable liquids and combustible liquids inside a storage cabinet shall not exceed 500 L (120 gal), of which not more than 250 L (60 gal) may be flammable liquids.

Do not locate more than three storage cabinets in a building, unless:

- cabinets are placed in groups of three or less in one location
- the distance between groups of cabinets is not less than 30 m (100 ft.)

Ventilation for Storage

Storage cabinets approved for fire protection are not required to be vented to the outdoors; however, where a respiratory or other health hazard may exist from the accumulation of hazardous vapors, positive mechanical ventilation is required. Where ventilation systems are not used or required, closures for ventilation within cabinet openings shall remain in place.

Additional Storage Requirements

Do not store containers of hazardous materials on ice or within 100 m [CAN] or 100 ft. [USA] of any body of water.

Store flammable or combustible materials in quantities greater than those required for everyday use in a separate structure built of non-combustible material, and located at a safe distance from gas compressor buildings, pump shelters and densitometer/instrument/sample buildings.

If the flammable or combustible materials are normally used in the gas compressor building, pump shelter or densitometer/instrument/sample building, then the materials may be stored there.

Store all flammable liquids in the original container or in other approved portable containers.

Do not store incompatible materials together.

Store containers of hazardous materials using one or more of the following methods:

- spill pallets
- trays
- impermeable tarps with wood under the outside edges to provide curbed containment

Emergency spill cleanup equipment shall be readily accessible at permanent fuel storage tanks.

When transferring hazardous materials to or from storage tanks and drums, ensure spill control devices (e.g., spill pallets, absorbent pads, trays) are available, and use them to prevent contamination of soil, surface runoff water and groundwater.

Transporting Hazardous Materials

Transport hazardous materials in accordance with Hazardous Materials Transportation (HAZMAT) regulations [USA], or with the Transportation of Dangerous Goods (TDG) regulations [CAN].

Do not transport or store extra fuel for vehicles and equipment in vehicle trunks or in passenger compartments.

Extra fuel for equipment shall be carried in approved containers that comply with CSA B376 [CAN] or with NFPA 30 and HAZMAT Regulations [USA].

Enbridge vehicles transporting more than 200 L [CAN] or 119 gal [USA] of fuel or liquid hazardous materials to unattended locations and/or ROW Worksites shall be equipped with a spill kit containing:

- a shovel
- 30 m2 (36 sq. yd.) of 6-ml polyethylene sheeting
- 25 kg (55 lb.) of absorbent

Any vehicle containing hazardous materials in amounts greater than or equal to 450 kg (1000 lb.) or 500 L (119 gal in the USA) shall have a placard affixed on each exterior side, showing the type of material being transported. Tank trucks shall carry placards at all times unless the truck has been completely purged and cleaned.

In the USA, manifests are not required when transporting materials of trade on a single motor vehicle and not exceeding 440 lb., such as:

- containers up to 1 lb. or 1 pt.-size of Packing Group I material
- up to 66 lb. or 8 gal of Packing Group II, III or ORM-D
- up to 400 gal of diluted (not over 2%) Class 9 material
- cylinders (no larger than 220 lb. capacity) of 2.1 or 2.2 material

Obtain shipping documents [CAN]/manifests [USA] from the material supplier. Shipping documents or manifests may be in any form as long as they include the following:

- name of material
- hazardous class
- identification number
- total quantity
- emergency contact (Chemtrec 1-800-424-9300)

If a contracted vacuum truck or tank truck is used, give the driver a copy of the shipping documents [CAN] or manifests [USA] and SDS.

Trucks used to transport hazardous materials shall have a current copy of the Emergency Response Guidebook in the cab of the vehicle.

All transported hazardous materials shall be properly labeled in accordance with TDG or HAZMAT.

14.3 **Radiation and Radiography**

When required, a Contractor who is licensed and properly qualified to perform radiography and NDT testing will be contracted to provide these services.

In all instances where X-ray or gamma ray equipment is being used, the Contractor shall ensure the use, storage, handling, transportation, and disposal of radioactive substances is in compliance with all Applicable Legislation. All radiographic work completed by the Contractor shall be performed under the direction of a federally licensed Worker (radiographic technician) responsible for radiation safety.

Site Preparation/Work Control

Before radiography work begins, ensure:

- distinctive warning signs are posted – DANGER! RADIOACTIVE MATERIAL
- barricades or rope are placed to prevent access to the designated work area (Radiation Area)

Workers (and their vehicles and equipment) not involved in the radiography work shall remain outside of the designated Radiation Area until the radiographic technician provides notification that testing is complete and it is safe to enter.

Additional radiography requirements include:

- where required by Applicable Legislation, radiographic inspection vehicles shall have 360 degree rotating amber lights on the roof and be clearly visible; the rotating lights shall be operating when X-ray/Gamma ray equipment is in use
- equipment or storage containers holding radioactive material shall be labeled “DANGER! RADIOACTIVE MATERIAL” and locked when not in use; a nameplate shall also be affixed to the equipment/container showing the owner’s name, the maximum quantity, the type of radioactive material and a symbol (trefoil) indicating ionizing radiation
- in an emergency or Facility evacuation, the radiographic technician shall ensure that the radioactive source is in a secure position, isolated and safe before leaving the work area

Contractors performing this work are responsible for acquiring, transferring or disposing of any and all radioactive material associated with this testing. When legally required to have an Radiation Safety Officer (RSO) present, the Contractor shall provide a Qualified individual.

Sealed Radioactive Sources

Acquisition of radioactive materials for installation on Enbridge operating assets shall be made in accordance with the existing specific licenses and coordinated through the Enbridge RSO. Any new source material and source holders shall be added to the license through an amendment, and prior to purchase. All shipments of such material shall be completed in accordance with the current license including the issuance of transfer documents for shipping and the receipt of the material.

Radiation sources for installation or removal shall only be handled only by an individual who is licensed and Qualified to handle the specific source and holder in question.

At the time of installation, a radiation survey shall be performed by the installer to ensure that the source and holder are operating properly and radiation levels around the source are within expected background levels.

14.4 **Asbestos Management Program**

Determine if work in an area will disturb, or has the potential to disturb, confirmed or presumed Asbestos-Containing Materials (ACM). Consult the General Asbestos Removal Procedure found in the GDL (under IMS-04 Tier 2 procedures) for information applicable to your jurisdiction prior to engaging in any work that involves the removal or disturbance of ACM

Procedures for removing asbestos are largely similar, but with some slight differences in each jurisdiction (e.g. country, province, state, or local municipality). Contact Corporate Health & Safety personnel 30 days in advance of asbestos remediation projects, and obtain clarification or verification of applicable procedures or updates/changes to the procedures.

Completion of Asbestos Awareness training is required for all Workers who could potentially be exposed to Asbestos Containing Material (ACM). In addition to this general awareness training, Workers can access resources and written materials from Health and Safety. Additional training may be required for Workers who engage in specific work activities involving ACM.

Contractors shall evaluate the awareness training requirement based on work type.

All products with asbestos fibers and all containers of asbestos shall be labeled as follows:

- Danger: contains asbestos fibers. Avoid creating dust. Cancer and lung disease hazard

Asbestos fibers inhaled into the lungs can lead to lung cancer, asbestosis or mesothelioma.

If a Worker's exposure to asbestos is verified as beyond the 8-hour TWA limit of 0.1 f/cc and/or the 30-min excursion limit of 1 f/cc and/or the 30-min excursion limit of 1 f/cc, then Medical Surveillance of that Worker shall be required.

Where Atmospheric Monitoring indicates that the TWA and/or excursion limit is exceeded, a written program to reduce Worker exposure shall be implemented regionally.

Determining the Presence of ACMs or PACMs

The following are common examples of ACMs that are known to contain asbestos or presumed (PACM) to contain asbestos:

- insulation on abandoned waste heat boilers and piping
- plain and perforated asbestos board panels on interior walls and ceilings, e.g., in some Station buildings
- insulation on standby generator exhaust piping
- some floor tiles
- gasket material on pumping units
- flanges on piping
- some pipe coating, e.g., coal tar wrap
- underground concrete electrical duct banks at Terminal Sites
- vermiculite insulation
- electrical switchgear

To determine the location of ACMs, review the Asbestos Inventory. Contact the Corporate Health & Safety Department or an Enbridge Representative for the Asbestos Inventory.

Bulk samples for laboratory asbestos analysis shall be taken by a Qualified Worker. Samples shall be collected in accordance with the procedures outlined in the appropriate Asbestos Procedure found in the GDL (under IMS-04 Tier 2 procedures).

14.5 **GHS/WHMIS/HAZCOM**

This section identifies the basic components of:

- the Globally Harmonized System (GHS) of Classification and Labelling of Chemicals;
- the Workplace Hazardous Materials Information System (WHMIS); in force in Canada; and
- the Hazards Communication (HAZCOM) Standard; in force in the USA

These regulatory measures are largely similar, and are generally designed to protect Workers from harmful workplace exposures to controlled or hazardous products.

GHS, WHMIS and HAZCOM are systems that:

- define and classify the hazards of chemical products; and
- communicate health and safety information on labels and material safety data sheets (called Safety Data Sheets, or SDSs, in GHS)

Under GHS, WHMIS and HAZCOM:

- Workers shall not be exposed to a concentration of a harmful substance that exceeds its Occupational Exposure Limits
- Workers shall be informed of and understand the known hazards of materials used in the workplace
- Workers shall receive appropriate training in hazardous materials and protective measures

People Leaders are responsible for the following:

- determining the potential for Worker exposure to hazardous materials at Enbridge Locations, including assessing how the each hazardous material is used
- establishing protective measures based on the assessment and SDS, including:
- engineering controls (e.g., mechanical ventilation)
- substitution of the hazardous material with an alternative, less hazardous material, where practicable
- administrative controls (e.g., adjusting an employee’s work schedule)
- effective use of PPE
- ensuring new or transferred employees receive initial training in GHS/HAZCOM/WHMIS as part of safety orientations
- ensuring applicable SDS are readily available to Workers at each Enbridge Location

- ensuring Workers are familiar with the SDS for all hazardous materials used at the Facility or Site, and that the applicable SDS is reviewed before a product is used for the first time
- ensuring Workers are provided with information about hazardous materials to which they may be exposed before starting a non-routine task (e.g., applying fiberglass), including:
- hazard analysis
- actions to limit exposure
- safe work practices
- ensuring hazardous material containers are properly labeled
- ensuring a current and complete inventory of all hazardous materials is maintained for each Facility or Site
- ensuring any missing SDSs for hazardous materials used at a Facility are obtained from vendors and a copy of the SDS is sent to Health & Safety
- ensuring Worker concerns are discussed, where Workers may be exposed to hazardous materials during routine activities
- obtaining and sharing appropriate hazard information with Contractors, during Contractor orientations

SDSs contain detailed information about controlled products, including:

- date of preparation of SDS
- hazardous ingredients
- exposure limits
- known health hazards
- physical hazards
- release procedures
- personal protection
- first aid measures
- routes of entry
- physical and chemical characteristics
- precautions for safe handling and use
- appropriate control measures
- emergency response information

Enbridge SDS can be accessed on all sites through the online system. Contact an Enbridge Representative for an SDS when needed or required.

14.6 **Respiratory Hazards**

At Enbridge Locations where there is the potential for Workers to be exposed to the respiratory hazards detailed in this section, the following shall occur:

- implement engineering controls and work practices to reduce employee exposure to below the Exposure Limit
- develop a Hazard Assessment and ensure a control plan is completed
- have provisions for site-specific contingency/emergency plan
- ensure personal exposure monitoring is performed where required
- make detection and monitoring equipment available for personal and area monitoring (refer to section 11.2)
- before work begins, inform employees of any potential exposures at the Site or Facility
- communicate the results of exposure monitoring to all affected employees

- ensure initial and periodic Atmospheric Monitoring is completed where required (refer to section 11.2)
- beyond the basic PPE, also make available any additional PPE or RPE that may be required for a given hazard (refer to section 7.9)

Prevention of H_2S Exposures

Hydrogen Sulfide (H_2S) enters the body through inhalation. It is:

- a toxic, colorless gas which has the odor of rotten eggs at low concentrations
- soluble in water
- highly flammable
- heavier than air

Health effects of exposure to H_2S can include:

- at low concentrations – headache, nausea, fatigue, dizziness, shortness of breath, cough; skin, eye and throat irritation; and/or loss of sense of smell
- at high concentrations – shock, convulsions, inability to breathe, unconsciousness or death

H_2S may be present in various work locations or circumstances, such as:

- Open Systems
- when present as a free or released product
- in a sump or tank, especially when open to atmosphere (e.g., H_2S may release into the air when the contents in the sump or tank bottoms is stirred)

H2S has poor warning properties. Olfactory (sense of smell) fatigue can occur with prolonged exposure to low concentrations (less than 100 ppm) or acutely at high concentrations (greater than 100 ppm).

Prevention of Benzene Exposures

Benzene is a type of hydrocarbon that may be present in a variety of crude oil and chemical products. Benzene is:

- extremely toxic, with carcinogenic properties; it can enter the body through inhalation, ingestion and skin absorption
- a clear, colorless liquid with a pleasant, sweet odor; the odor, however, does not provide adequate warning of its presence as a hazard
- highly flammable, with a low flash point
- as a vapor is heavier than air, and can form explosive mixtures
- as a liquid is not soluble in water and will float (as it is lighter than water)

Health effects of exposure to benzene can include:

- moderate to severe irritation to the skin, and eyes, and mucous membranes
- aspiration

Short-term exposure to high concentrations of benzene may lead to gastrointestinal and neurological toxicity.

Long-term exposures of benzene, even at low concentrations, may lead to blood disorders such as anemia or leukemia and other cancers.

The 8-hour Threshold Limit Value (TLV) for benzene is 0.5ppm, and the Short-Term Exposure Limit (STEL) for benzene is 2.5ppm.

Benzene exposure may be found in the following locations and situations:

- gasoline and petroleum pipelines
- pipeline valve assemblies
- tank repair, maintenance and cleaning operations
- field maintenance operations
- bulk terminals and service station operations
- any Open System operations
- lab operations
- leak sites and free/released product

In addition to other appropriate controls or measures, follow these controls for benzene:

- continuous or periodic Atmospheric Monitoring and monitoring of benzene shall be conducted tasks where a potential for benzene exposure occurs
- signs shall be posted at entrances to any identified areas that contain benzene
- chemicals containing benzene shall be secondarily contained and have proper signage when not part of the Enbridge operating system
- food and drink should not be stored or consumed in areas where benzene is, or may be present; always wash hands prior to eating, drinking or smoking to reduce possible ingestion
- designated areas for use and storage of benzene shall be established

Where exposure to benzene above the Exposure Limit is known or suspected, appropriate work practices, engineering controls and PPE requirements shall be implemented.

Prevention of Oxygen Deficiency

Normal air contains approximately 21% oxygen and 79% nitrogen. Oxygen deficient atmospheres occur when the percentage of Oxygen drops below 19.5%.

Oxygen deficient atmospheres may occur in different circumstances or locations, such as:

- during purging operations
- when the use of CO_2 or Halon fire extinguishing systems displaces oxygen (as part of putting out the fire)
- in enclosed spaces, e.g., where the presence of petroleum vapors can lead to an oxygen deficiency

In other cases, the presence of petroleum vapors is not the issue. For example, in a sealed, cleaned tank, some oxygen is used up as the interior walls of the tank rust, creating an oxygen deficient atmosphere.

Health effects of being exposed to an oxygen deficient atmosphere include:

- deep and rapid breathing
- if the oxygen level goes as low as 16%, the effects progress to dizziness, rapid heartbeat, headache and a possible inability to move
- at 14% and lower, humans cannot survive

Nuisance Dusts

Nuisance dusts are a common workplace air contaminant. Dusts can become a respiratory hazard to Workers when sufficient amounts of inhalable or respirable particulates are present in work space air.

Nuisance dusts can be generated by many commonly used work practices within Enbridge. Work practices can include, but are not limited to:

- abrasive blasting
- cutting and grinding

TLVs for inhalable and respirable particulates are 3 milligram per cubic meter (mg/m3) and 10 mg/m3, respectively.

Where Worker exposure to nuisance dusts above a TLV is known or suspected specific work practices and control measure must be in place. This may include one or more of the following practices:

- dilution ventilation
- general or local exhaust ventilation
- RPE
- skin protective equipment or clothing
- dust suppression or wetting

Cadmium and Lead

Cadmium and lead are toxic metals commonly found in industrial paints and coatings. Because of their anti-rust and anti-fouling properties, cadmium and lead are often electroplated onto steel nuts, bolts, and rivets. Operations involving the removal of cadmium and lead paints may pose a significant exposure hazard.

Prior to commencing operations that involve the disturbance of painted surfaces in Enbridge facilities, determination of the presence or absence of lead and cadmium shall be conducted. If the presence of cadmium or lead is detected in painted materials, work practices and exposure control strategies outlined in the Cadmium and Lead processes found in the GDL (under IMS-04 Tier 2 processes) shall be strictly followed. Sampling of materials shall only be performed by a Qualified Person in accordance with the process.

Welding Fumes

Jobs involving welding activities are known for generating high levels of welding fumes (either general welding fumes or specific metal fumes), which may pose a health hazard to the health of welders or other Workers in the vicinity of the job. A combination of respiratory protection and ventilation is required to control hazards associated with welding fumes.

If conditions allow, air sampling for welding fumes shall be implemented, the main target of the sampling will be welding activities performed inside of Confined Spaces to determine exposures to the following:

- total welding fumes
- chromium
- chromium VI

- nickel
- manganese

Crystalline Silica

When Workers chip, cut, drill, or grind objects that contain crystalline silica (such as concrete cutting) it can become a respiratory hazard.

Crystalline silica (refractory materials) is found in materials commonly used to insulate crude oil heaters including:

- insulating Firebrick and Insulating Castable, which break down through the normal cycling of the heater and the turbulent flue gas, creating dusts that are disturbed on entry
- Kaowool Blanket Products, which may contain crystalline silica after being exposed to temperatures above 982°C (1800°F) (Such temperatures are not unusual during normal operation of the crude oil heaters)

Specific work practices and control measure must be in place when engaging in work that involves exposure to crystalline silica. Review the Crystalline Silica Process found in the GDL (under IMS-04 Tier 2 processes) prior to any work where exposure to crystalline silica is known or suspected.

14.7 Nitrogen (Pipeline Purging)

Nitrogen is a colorless, odorless, relatively inert gas. Nitrogen is used to purge product from the pipeline in preparation for certain work activities.

Once the pipeline is purged, excess nitrogen is vented (i.e., the pipeline is depressurized) and residual nitrogen remains in the pipeline.

To reduce risks of exposure, consider the following factors and hazards:

- Increasing the nitrogen concentration in air lowers the oxygen concentration. If the concentration of nitrogen is too high (and oxygen too low), a person will become oxygen deprived and simple asphyxiation occurs.
- Nitrogen is usually transported and stored in liquid form. Always use nitrogen in a well-ventilated area.
- The transition from liquid to gas can generate a lot of pressure quickly, which causes cold temperatures. Liquid nitrogen is extremely cold and can cause severe frostbite upon contact.
- Cold nitrogen gas is heavier than air, so the risk of exposure to nitrogen is greatest in low lying areas, e.g., Excavations, tank berms, vaults and culverts.

Site Preparation / Work Controls

To reduce potential exposures to nitrogen, use controls such as:

- install a windsock, for monitoring wind direction
- ensure SCBA (2 minimum) and fire extinguishers are readily available
- always position liquid nitrogen trucks/tanks, injection equipment and blow-down tanks in well-ventilated areas (to prevent accumulation of excessive concentrations of nitrogen)
- install piping or hoses to vents and locate discharge ends downwind away from work area; inform Workers to stay clear
- ensure Workers wear hearing protection during nitrogen injection and venting activities

- ensure Workers wear appropriate eye/face protection, RPE, insulated gloves and body protection as needed, when handling or operating purging equipment

Workers not directly involved in nitrogen purging activities shall stay upwind, out of the work area and in designated safe zones.

15.0 Ground Disturbance Standard

15.1 Damage Prevention

Ground Disturbance Planning

For Ground Disturbance planning, these requirements shall be followed:

- obtain a Ground Disturbance Permit for all Enbridge Ground Disturbance activities (Ground Disturbance Permits are not valid beyond 7 days, as long as the one-call locate remains valid)
- the Excavator/Ground Disturber shall request a One-Call and obtain a locate ticket prior to any Ground Disturbance activities
- all approvals, applicable records, drawings and documentation, including One-Call Tickets, shall remain on site and be accessible, as part of the Ground Disturbance Package
- the Excavation Area shall be marked with pink and white striped flagging

The Locate Boundary Area shall be marked with white markings, with the following exceptions:

- other visible markings shall be used in snow conditions
- ROW markers shall be used for Mainline Construction

Locate Phase

After the Locate Boundary Area is defined, an Initial Locate shall be completed. When the Ground Disturbance is being conducted by a Contractor performing work for Enbridge, a Verification Locate shall also be performed.

In the Locate Boundary Area all Below Grade Facilities shall be Surface Located within the excavation perimeter and extending 30 m (100 ft.) from that perimeter.

The Locate Boundary Area may be lessened in the following situation:

- when constrained by a defined ROW boundary
- when constrained by surface features such as:
    - improved roadway or railway
    - tree line/shrub line
    - fence (temporary or permanent)
    - building
    - cement or concrete parking area
    - other steel, concrete, or similar above ground improvement

The lessened area shall be marked by multiple white markers identifying all of the corners of the Locate Boundary Area.

Notwithstanding the above, when the Locate Boundary Area is constrained by property boundaries all Below Grade Facilities shall be identified through other means, such as historical records, One-Call services, or visual searches.

The Locate Boundary Area can include any additional temporary workspace and/or access that may be necessary. Extra workspace or access may be used for such purposes as:

- heavy equipment traffic as part of the excavation work, and/or
- a storage area for spoil, equipment, and/or materials

Initial Locate (One-Call response)

Below Grade Facilities shall be located and marked as follows:

- Facility owners or their authorized Contractor shall conduct Initial Locates
- additional Locates beyond the Locate Boundary Area may be required to verify alignment or location of Below Grade Facilities
- within a Fenced Station/Terminal, locate markers shall be spaced no more than 3 m (10 ft.) apart, directly over the centerline of the Below Grade Facility
- on the ROW there shall be a clear line of vision between markers used to identify a particular facility location; the markers shall be placed directly over the centerline of the Below Grade Facility at maximum intervals of 10 m (30 ft.) unless another reasonable interval is appropriate
- reconfirming the Initial Locate/making a new One-Call is required in the following situations:
    - when markers become dislodged, removed, unrecognizable
    - when Initial Locates expire as per the One-Call ticket
    - when a new Contractor or Subcontractor is retained to conduct Ground Disturbance work in the area as there shall be no piggybacking on existing tickets
    - if there is a change in the scope of work (i.e., change in the Excavation Area)
    - upon resumption of work at an open Excavation

If the Excavation Perimeter moves, the One-Call shall be resubmitted, unless the Excavation Perimeter remains completely within Locate Boundary Area.

Before resuming activities previously initiated by others:

- review the location and identification of Facilities
- reconfirm the Initial Locate
- determine if a new One-Call is required

Non Enbridge Below Grade Facilities shall be marked by their respective Facility owners.

When Below Grade Facilities are Located, compare all applicable records, drawings and documentation, and conduct a visual check to confirm that all Locates accurately reflect the location of all Below Grade Facilities in the Locate Boundary Area.

Markings

Markings shall remain in place for the duration of the work activities. If any markers are removed, or become dislodged or unrecognizable, then immediately notify the Enbridge Site Inspector.

Markings shall:

- be highly visible to equipment operators despite local conditions (e.g., wind, snow)
- adhere to the American Public Works Association (APWA) uniform colour code, unless otherwise documented.

Temporary markers shall be removed upon completion of the work.

Verification Locate (Required for Contractor Ground Disturbances)

When required, the Verification Locate shall be performed over the entire Locate Boundary Area and shall follow these requirements:

- Ensure the Verification Locate is performed by a locator (operator qualifications may be required) other than the individual who performed the Initial Locate.
- Confirm the accuracy of all Initial Locates.
- Identify unknown or undocumented facilities in the Locate Boundary Area, resulting from the Initial Locate or Verification Locate.
- Report any discrepancies to the Ground Disturbance Supervisor and to the Facility owner.
- Investigate and resolve any reported discrepancies.

Provide all appropriate records, drawings and documentation to the party performing the Verification Locate. Further Verification Locates may be performed if deemed necessary by the Excavator/Ground Disturber.

15.2 Positive Identification (Exposure) of Below Grade Facilities

These Positive Identification specifications are the minimum requirements. Additional Positive Identification may be required based on the Hazard Assessment.

Prior to beginning Mechanical Excavation or any other potentially destructive below grade activity, the location of Below Grade Facilities shall be Positively Identified by:

- Hand Expose, or
- Vacuum Excavating.

Positive Identification shall be to a sufficient width to visually identify (Positively Identify) the location, direction/alignment, depth, size and type of all Below Grade Facilities.

All known Appurtenances and pipe weights shall be Positively Identified prior to Mechanical Excavation.

Positive Identification shall be completed on all Below Grade Facilities within the entire Excavation perimeter and 5 m (16 ft.) outside the Excavation perimeter.

Follow these steps when identifying Below Grade Facilities:

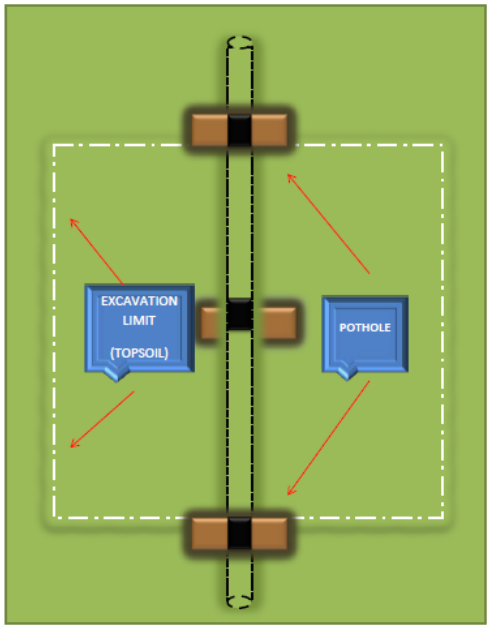
- before Positive Identification begins, Facility identification markings shall be reviewed to determine if additional Positive Identification is required
- use a minimum of three Positive Identification points to verify alignment, i.e., beginning, middle and end
- if a located Below Grade Facility does not intersect the excavation but is within the 5 m (16 ft.) area beyond the excavation area, determine location with a minimum of 2 exposure points

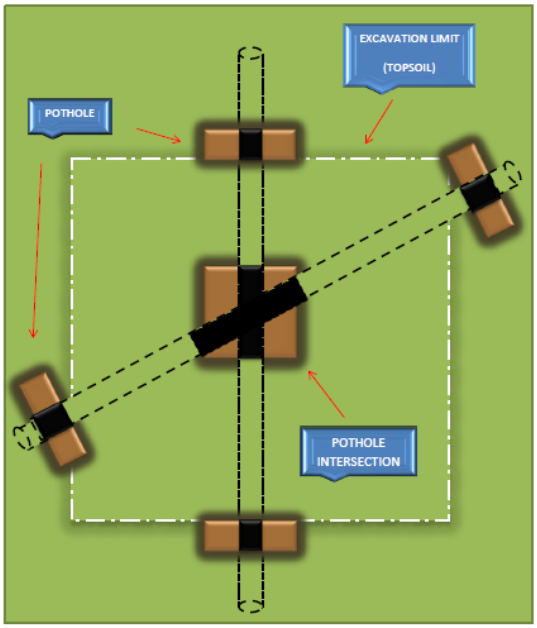
Adjacent Below Grade Facilities within 5m (16 ft.) of the Excavation perimeter shall, at a minimum, be exposed on the working side, with the following exceptions for non-Station/Terminal sites:

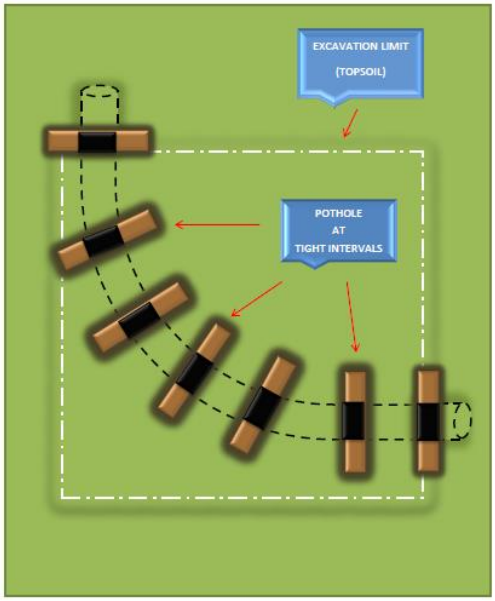
    - If Locate Boundary Area is less than 5 m (16 ft.), only Positively Identify within the Locate Boundary Area.

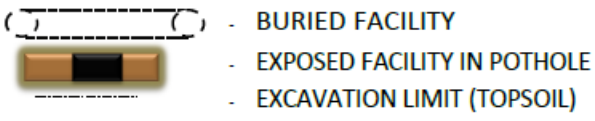
- On the ROW and when allowed by Applicable Legislation (not in AER regulated areas) and if multiple parallel pipelines exist; in such cases only the most adjacent Enbridge-operated pipeline/s needs to be Positively Identified providing all the pipelines on the ROW have been located

The following diagrams are examples of positive identification.









Alternatively, when the Excavation work area is congested with Below Grade Facilities, a perimeter slot trench may be completed. It shall be dug at a minimum of

1 m (3 ft.) outside the Excavation perimeter to a depth of 0.6 m (2 ft.) deeper than the planned Excavation.

When the perimeter slot trenching method is used, follow these requirements:

- If a Below Grade Facility passes through the perimeter slot trench, a sight hole in the middle of the Excavation Area shall be performed to ensure depth, alignment, and size.
- If a Below Grade Facility does not exit the Excavation Area, it shall be Positively Identified at sufficient intervals to establish its termination point.

If the entire Excavation Area is going to be Vacuum Excavated or Hand Exposed then the Positive Identification of the Below Grade Facilities to 5 m (16 ft.) does not need to occur. If the scope changes and Mechanical Excavation is required, then Positive Identification shall be completed in accordance with all of the above-noted requirements for Mechanical Excavations.

If backfilling of the exposure hole is required once the Below Grade Facility is exposed, it shall be identified and marked with the required information (Facility owner, depth, size and type of facility) and APWA uniform colour code. Ensure the identification of Below Grade Facilities is clearly visible to all traffic and that Positive Identification can be maintained.

When Below Grade Facilities are positively identified, ensure these requirements are completed:

- compare all records, drawings and documentation; and
- conduct a visual check to confirm that the Positive Identification accurately reflects the location of all Below Grade Facilities

Probing

Probing for Positive Identification is not permitted unless approved by regional management (director or designate) based on ground conditions. Approval to probe shall be documented on the Hazard Assessment.

When the use of probes is approved, probes shall have rounded or blunt tips to prevent damage to Below Grade Facilities.

Probing is acceptable in the following situations:

- maintaining mechanical clearance (provided Positive Identification has been performed and is maintained)
- depth of cover
- preliminary probe reports for crossings
- other situations that do not involve Positive Identification

15.3 **Mechanical Clearance**

No Mechanical Excavation shall occur within 600 mm (2 ft.) of a foreign Below Grade Facility.

No Mechanical Excavation shall occur within 600 mm (2 ft.) of an Enbridge Below Grade Facility unless the following conditions are met:

- the Below Grade Facility is exposed on the top and sides at locations sufficient to confirm alignment, and
- The Enbridge Facility owner or Enbridge Site Inspector approves and directly observes the excavating activities

At no time shall mechanical excavating equipment be within 300 mm (1 ft.) of an Enbridge Below Grade Facility. For clarity, the final 300 mm (1 ft.) of soil around a facility shall be removed by Hand Exposure, water washing or other non-mechanical means.

Mechanical Clearance will be adjusted when the crossing agreement or Applicable Legislation is more stringent.

Before excavation begins, Site Supervisors shall review site conditions with the Equipment Operator(s) and Spotter(s). The review shall address the following:

- location and identification of Below Grade Facilities and Appurtenances
- type of Below Grade Facilities and Appurtenances
- depth of Below Grade Facilities and Appurtenances
- direction of Below Grade Facilities and Appurtenances
- any other relevant factors

15.4 **Roles and Responsibilities**

Regional or Project Management shall ensure the following Ground Disturbance roles (or equivalent roles) are assigned to the appropriate Worker, as applicable to a project or work activity.

All Workers assigned to one or more of the Ground Disturbance roles noted in this sub-section shall, at a minimum, have successfully completed a Ground Disturbance course that meets Enbridge's training requirements.

The Ground Disturbance Inspector/Enbridge Representative shall ensure:

- Crossing Agreements are obtained as required
- activities involving mechanized equipment are adequately supervised
- all Below Grade Facilities in the work area are Surface Located according to the One-Call ticket request and in accordance with this Standard and other applicable policies
- any other necessary safety controls are implemented considering the unique aspects of the work
- that all applicable locate documentation matches a visual check of the Worksite
- the appropriate permits and Hazard Assessments are completed prior to beginning work activities
- Workers and Facilities are adequately protected in accordance with Enbridge requirements, Hazard Assessment processes and this manual
- work is stopped when there is a concern for safety, pipeline integrity, or damage to equipment or Facilities
- exposed pipes, conduits, and cables are not damaged, as confirmed by visual inspection in the ditch/Excavation before backfilling
- Crossing Agreements are reviewed and maintained on site as part of the Ground Disturbance Package
- that Below Grade Facilities are not damaged, as confirmed by visual inspection before backfilling
- any discrepancies for Below Grade Facility Locates are resolved
- all Workers have the appropriate training and that records of such training are maintained and accessible

For Contractor Excavations, the Ground Disturbance Inspector/Enbridge Representative shall:

- be present at the side of the Excavation for any Mechanical Excavation or activity with the potential for damage
- ensure the appropriate parts of the Ground Disturbance Package are reviewed with the Contractor

The Excavator/Ground Disturber shall:

- obtain verification and review with the Ground Disturbance Inspector/Enbridge Representative that all applicable Crossing Agreements and/or Proximity Agreements have been obtained, as part of the line location and verification process
- ensure Excavation activities (including the Spotter and Operator) are overseen by a Supervisor/Foreman/Competent Person
- ensure a One-Call is placed and confirm the One-Call is valid
- ensure that when there is a discrepancy between the documentation and the line Locates that cannot be reconciled, that the discrepancy is resolved (note: a perimeter slot trench is the preferred method of Positively Identifying Below Grade Facilities when a discrepancy cannot be resolved)
- ensure that smaller diameter (NPS 4 or less) non-metallic pipelines (for example PVC, polyethylene, or other synthetic compounds) and all cables (electrical, communication, etc.) are exposed across the full width of the proposed trench or Excavation, by using Hand Expose or Vacuum Excavation unless a hazard assessment indicates that exposing the length of the utility creates an integrity hazard

The Ground Disturbance Supervisor/Foreman/Competent Person shall:

- ensure all required documents are kept on-site as part of the Ground Disturbance Package
- ensure required documents from the Ground Disturbance Package are provided to the party performing the Locates
- reconfirm the Locates if required
- investigate and resolve or reconcile any Locate discrepancies
- ensure a comparison of all applicable Locate documentation matches a visual check of the Worksite
- review the Excavation and the Hazard Assessment with the Ground Disturbance Inspector/Enbridge Representative
- ensure the appropriate permits and Hazard Assessments are completed prior to beginning work activities
- stop work and consult with the Ground Disturbance Inspector/Enbridge Representative upon discovery of any non-Located facility, or if there is any contact between equipment and any Below Grade Facility

Typically the role of Ground Disturbance Supervisor/Foreman/Competent Person will be assigned to Contractor Personnel, unless the Contractor is working under the direct supervision of Pipeline Maintenance.

The Equipment Operator shall:

- know the location of all Below Grade Facilities and Appurtenances
- discuss and agree on hand signals with the designated Spotter
- follow all signals given by the Spotter
- be deemed Qualified by a Enbridge Representative for hotline work

- not excavate until a Spotter is present with the required signaling device
- ensure Spotters understand their responsibilities
- ensure One-Call notifications have been followed
- review all documentation/drawings
- maintain all required clearances
- stop work if Positive Identification is lost

The Ground Disturbance Spotter shall:

- check the location of all Below Grade Facilities in the work area and assist the operator in maintaining required clearances and depth of cuts
- observe progress and use hand signals and/or verbal communication to alert the Operator to potential dangers
- stop the work if uncontrolled hazards arise (e.g., unidentified Below Grade Facilities, contact between the excavation equipment and a facility)
- be continually aware that not all Below Grade Facilities are marked with warning tape (or with the correct color of warning tape) or provided with proper barriers
- possess a signaling device (e.g., an air horn is best) to alert the equipment Operator to potential dangers
- be clearly identified by wearing high visibility apparel that meets all applicable requirements and is distinguishable from others on site

15.5 **Pile Driving, Auguring, Boring, and Drilling**

All Ground Disturbance requirements and practices set out in this Standard and any associated procedures shall be met when performing these activities.

When pile driving in congested areas with high risk potential for damage to Below Grade Facilities, a pilot hole shall be Vacuum Excavated to a minimum depth of 3 m (10 ft.) and to a diameter equal to that of the pile.

All boring pathways shall be Positively Identified where the boring pathway intersects the sheeting to maintain appropriate clearances.

When a boring device is used to install a Facility across one or more Below Grade Facilities, the depth of the device shall be confirmed to ensure that a 1 m (3 ft.) separation is maintained from all Below Grade Facilities. This includes the pilot hole and the reamed path.

Minimum separations are outlined in the specific procedures for slip-boring, horizontal/directional drilling, and drilling vertical and open vertical bores.

16.0 Excavation Safety Standard

16.1 Mechanical Excavation

Workers shall halt the Excavation process if Positive Identification of the Below Grade Facility or the facility markers has been lost at any time.

Workers shall identify the depth of Below Grade Facilities before excavating to prevent heavy equipment or commercial vehicles from crossing without approval or notification.

When excavating in the vicinity of an adjacent pipeline, hazard controls shall be implemented to ensure that excavation activities do not undermine or add stress to the adjacent pipeline. If signs of soil instability or stress occur during such work, excavating operations shall be immediately suspended and the Ground Disturbance Foreman/Supervisor shall be notified.

Excavation shall not resume until adequate measures to protect the adjacent pipeline against movement/stress associated with the excavation are taken (e.g., sheet piling may be installed as protection) to the satisfaction of the Facility owner.

All Mechanical Excavation shall stop immediately if there is Contact or a Near Miss with a Below Grade Facility. The excavating equipment shall be immediately shut down and left in place, if safe to do so. Any Below Grade Facility contact or Near Miss shall be reported immediately to the Ground Disturbance Inspector/Enbridge Representative and shall be investigated as required.

Buckets without teeth shall be utilized, or the bucket teeth shall be protected by a flat bar. Unless prohibited by a crossing agreement written approval is required from Operations Management (or designate) for the use of buckets with teeth.

When the use of buckets with teeth has been approved, the Ground Disturbance Inspector shall be on-site at all times during all activities where teeth are required. In addition, the following requirements shall be met:

- use of buckets with teeth shall be limited to the removal of rock, concrete, asphalt, or frozen soil, no closer than 0.6 m (2 ft.) from any Below Grade Facility
- a Hazard Assessment shall be completed by the Contractor and approved by the Enbridge Site Inspector/Enbridge Representative
- before the task is carried out, a pre-job meeting shall be conducted with the crew to review hazards and processes anticipated for the Ground Disturbance activities or factors
- all Below Grade Facilities shall be Surface Located and Positively Identified
- when passing or swinging the bucket over Facilities, the Operator shall maintain safe clearances, keeping the bucket curled and the teeth pointed up
- once the approved activities are complete, buckets without teeth shall then be used for all other activities, or the bucket teeth shall be protected by a flat bar

Dozers with ripper teeth shall not be allowed on an Enbridge ROW or near Below Grade Facilities without written approval from Operations Management (or designate). This approval does not apply to Greenfield work.

Manually-operated jack hammers or hoes equipped with jack hammers are prohibited from working directly over a Below Grade Facility.

16.2 **Worker Protection**

Prior to entering a Working Excavation, the Excavation Checklist shall be completed.

When Working Excavations meet the criteria for a Confined Space Entry as outlined in the Confined Space Standard, entry into the Working Excavation shall be treated as entering a Confined Space.

Workers shall be prohibited from entering any unsafe Excavation. When a Working Excavation is more than 1.2 m (4 ft.) deep, Workers shall be protected from cave-ins by sloping the sides of the Excavation and/or installing temporary protective structures, such as shoring or trench boxes.

Ensure sufficient space is provided in Working Excavations to perform all required tasks, including adequate clearance under and between Facilities and walls.

When installing components in a shoring system, each brace shall be installed in descending order using a ladder and working downward from the surface. The reverse order shall be used to remove components, unless conditions make it unsafe for Workers to enter the excavation. In such cases, an alternate method of removal that protects Workers from injury shall be used.

Shoring shall extend a minimum of 400 mm (18 in.) above the surface of the ground or vertical trench walls when surrounding site conditions are sloping toward the Excavation. When site conditions are flat, shoring only needs to extend to ground level.

A professional engineer shall be consulted to review the stability of any structure or foundation that may be affected by an excavation or trench. If required, a temporary protective structure shall be designed, constructed, and installed to support the structure or foundation in accordance with the specifications of a professional engineer.

A professional engineer shall design any support system used in an Excavation greater than 6 m (20 ft.) deep.

Trench Boxes shall be designed by a professional engineer. Before the trench box is installed, a copy of the engineering certificate or a stamped engineering drawing, including assembly instructions, shall be available. Trench boxes stacked in deep Excavations shall be adequately secured to one another, in accordance with the engineered design.

Trench Boxes shall have continuous sides and shall extend a minimum of 400 mm (18 in.) above the vertical wall of the Excavation when surrounding site conditions are sloping toward the excavation. When site conditions are flat, the Trench Box only needs to extend to ground level.

A registered professional engineer shall design and approve hoisting hook-up and drag points. Workers working in Trench Boxes shall:

- remain inside the box as long as they are in the Working Excavation
- leave if the Trench Box is to be moved
- maintain a distance at the end of a Trench Box of at least 1.5 times the height of an unprotected wall

The space between the Trench Box and the Excavation wall shall be backfilled in order to allow closer access to the top of the box and to limit soil movement in case of a cave-in.

Sheet Piles

When sheet piling is required to be installed, a professional engineer shall design it. A detailed procedure and Hazard Assessment must be submitted to the Enbridge for review. The following requirements shall also be met:

- review existing facilities for potential impacts (i.e., vibration) during the installation or removal process
- a Safety Watch (e.g., Rigger) with audible device and warning signs must be in place to keep unauthorized Workers out of the exclusion zone
- rated safety chains shall be used at all times

16.3 Classification of Soil and Rock

For Working Excavations, using the Excavation Checklist, a Qualified Worker shall classify each soil and rock deposit before and during excavation as one of the following soil types:

a) Type A – Hard and Compact, e.g., clay and cemented soils (equivalent to Type 2 in Ontario and Saskatchewan)

b) Type B – Likely to crack or crumble, e.g., angular gravel, silt loam, crushed rock (equivalent to Type 3 in Ontario and Saskatchewan)

c) Type C – Soft, sandy or loose soil, e.g., gravel, sand, submerged soil (equivalent to Type 4 in Ontario and Saskatchewan)

d) Stable Rock (equivalent to Type 1 soil in Ontario and Saskatchewan)

Each soil and rock deposit shall be classified by a Qualified Worker as Stable Rock, Type A, Type B, or Type C.

Soil cannot be classified as Type A if it is fissured, previously disturbed, if it has water seeping through it, or if it is subject to vibration.

Type B is previously disturbed soils except those which would otherwise be classed as Type C.

The determination to change the soil classification will depend on site-specific soil characteristics and Applicable Legislation.

A Qualified Worker shall classify soil types using the following methods:

- a visual test to determine the following:
    - qualitative information regarding the Excavation site in general
    - soil properties next to the Excavation
    - soil properties forming the sides of the opening Excavation
    - soil properties taken as samples from excavated material
- manual tests to determine quantitative as well as qualitative properties of soil and to provide more information for classifying soil property

Manual tests include the following:

    - plasticity test
    - dry strength
    - thumb penetration

- other strength tests (e.g., pocket penetrometer or hand-operated shear vane)

For classification and testing, treat frozen soil conditions the same as unfrozen soil conditions.

16.4 **Sloping**

The walls of the Excavation shall be sloped when the Excavation is greater than 1.2 m (4 ft.) deep and shoring or a Trench Box is not used.

One of the following options shall be used when designing slopes and benching systems.

- Class “C” soils shall not be benched and shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34° measured from the horizontal).
- Have a Qualified Worker classify the soil using manual and visual tests, and ensure a maximum slope as follows:
  - Type A&B: 1:1 (45°)
  - Type C: 1½:1 (34°)
- Install shoring or use a trench box
- Have a professional engineer design a support system for the excavation.

Benching is a type of sloping that is suitable for class A and B soils only. Benching is done by sloping the sides of the trench back in a series of steps (or benches) instead of at one steady angle. The angle of the benched soil shall not exceed 45 degrees from the horizontal.

16.5 **Exits and Entrances**

For Working Excavations, ensure:

- there are at least two entrances/exits
- there is an exit on each side of the pipe if Workers are required to work on either side of the pipe
- entrances and exits are in locations such that no Worker has to travel more than 8 m (25 ft.) laterally to the nearest means of egress
- ladders used in Working Excavations in the Province of Manitoba are placed no more than 3 m (10 ft.) from the Worker
- soil ramp entrances and exits have a maximum slope of 1:3
- egress ladders are placed inside the trench box
- side rails of ladders extend 1 m (3 ft.) above the shoring, trench box, or excavation
- ladders are properly secured

Stairs may be constructed with slopes at an angle between 30 and 50 degrees to the horizontal plane.

Trenches 1.2 m (4 ft.) or more in depth shall be provided a fixed means of egress.

16.6 **Material Storage**

All materials, tools, vehicles, and equipment shall be stored at least 1 m (3 ft.) from the edge of a Working Excavation.

Spoil piles shall be located a minimum of 1 m (3 ft.) from the edge of a Working Excavation. The slope of spoil piles next to Working Excavations shall not be at an angle greater than 45° from the horizontal. All loose materials shall be scraped from the sides of an Excavation and from walking and working areas where Workers will be present. Measures shall be taken to ensure that rocks and soil do not fall or roll into the Excavation.

Where parallel excavation will occur within 3 m (10 ft.) of an adjacent operating pipeline, storage of excess surplus spoil above the operating adjacent pipeline(s) shall only be allowed based on the completion of hoop stress calculations.

Hazardous materials or impacted soil may be encountered when excavating in or around known or suspected contaminated sites. Additional PPE and other necessary controls shall be identified on the Hazard Assessment, and by referring to the SDS as necessary.

For any activity where a Worker could come into contact with the product in the pipe, specific training requirements and proper PPE shall be required.

Any impacted soil shall be stockpiled in a designated location, properly segregated from clean soil until proper disposal can be arranged. Impacted material removed by Vacuum Excavation shall be disposed of properly. All impacted material shall be handled and disposed of with direction from the Enbridge Environmental Department.

16.7 **Fences and Barricades**

Unattended Excavations, trenches, and boreholes shall be barricaded or fenced off as appropriate, depending on conditions. The type of guarding and material shall be determined according to the level of risk associated with the Excavation.

Suitable warning devices shall be provided to ensure advance warning of Excavations, trenches, or boreholes that may present a hazard to traffic.

Along a ROW, unattended Excavations shall be guarded from unintentional entry by using highly visible material. In addition, barbed wire shall be used where livestock are present, unless the property owner requests alternative controls, such as buffalo or electric fencing.

Where a long trench is left open (e.g. for a new pipeline), use other reasonable methods to secure the excavation, including placing berms, stringing pipe along the ROW, and stripping topsoil.

Where a portion of an Excavation greater than 1.2 m (4 ft.) deep is constructed with vertical walls, use warning signs attached to barricades or ropes, or other appropriate methods to prevent Workers from entering that portion of the Excavation.

Barricades or fences shall be erected at a minimum of 1 m (3 ft.) from the Excavation edge to maintain an adequate walkway around the Excavation, unless space is limited.

Barricades and fences shall be minimum 1.1 m (42 inches) tall and fencing supports shall be adequate to ensure the integrity of the fencing/barricade is not compromised due to site, ground, weather or other conditions.

16.8 **Winter Conditions**

Extreme care shall be taken at all times with frozen soils since higher Excavation forces are required. In winter conditions:

- Be careful, especially at the 12 o'clock position where most Appurtenances may be located and potentially encapsulated within the frozen layer at a shallower depth than the pipe itself.
- There is a risk of large frozen soils with encapsulated rock that may damage the pipeline while being removed. Therefore, a mandatory 600 mm (2 ft.) clearance for Mechanical Excavation is required when excavating through frozen soils to the depth of frost.
- Use of buckets with teeth may be appropriate while digging through frost, if approved in accordance with Section 16.1 of this Standard.

The use of radiant ground-thawing equipment is recommended for thawing the ground within Station/Terminal Sites prior to excavation.

17.0 Fall Protection and Travel Restraint Standard

17.1 Personal Fall Arrest System

Workers shall wear a personal fall arrest system when:

- there is a potential to fall a vertical distance greater than 2 m (6 ft.)
- approaching within 1.5 m (5 ft.) of an unprotected leading edge over 2 m (6ft.) in height
- it is impractical to provide adequate work platforms, scaffolds, staging and guard rails
- working on Swingstages and in work cages
- working in a personnel basket (manbasket)

Enbridge Workers shall be trained in:

- the effective use of the fall protection equipment they are using
- identification and recognition of fall hazards
- control measures for fall hazards, including elimination of hazards where possible (such as use of safe, alternative methods, or alternate approaches to the work)

Workers on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 2 m (6 ft.) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems.

In addition to the work platform itself (i.e. floor, girder, beam, etc.) an independent means of support shall be used, consisting of either:

- a personal fall protection system consisting of a lifeline, rope-grabbing device, lanyard and shock-absorber and full body harness
- a retractable lanyard with a full body harness
- a lanyard with 100% tie-off capabilities and a full body harness

Secure or tie back a thrust-out or parapet hook to a solid part of the structure to prevent movement or dislodgement.

Anchor points shall be capable of withstanding at minimum of 5000 lb. shock load.

A fall prevention system shall be utilized whenever a person is on a wind girder without handrails, to install, adjust, or remove anchorage points.

17.2 Fall Protection Plan

A written Fall Protection Plan shall be completed by a Qualified Worker whenever Workers could potentially fall 2 m (6 ft.) or more where they are not protected by a guardrail system. The plan shall contain the following:

- fall hazards at the Worksite
- fall protection system(s) to be used
- anchors to be used
- clearance distances below the work area
- procedures used to assemble, maintain, inspect, use and disassemble the fall protection system
- rescue procedures to be used if a Worker falls from a height and is suspended in the air

- a determination that the walking/working surfaces at heights above 2 m (6 ft.) which Workers are to work or walk on have the strength and structural integrity to support those activities

17.3 Rescue

When a Worker is suspended from a height while using a fall arrest system, it can result in serious physical injury, or potentially death in less than 30 minutes.

To reduce the risks associated with short or long periods of suspension, follow these practices:

- rescue any suspended Workers as quickly as possible
- be aware that a suspended Worker is at risk of orthostatic intolerance and suspension trauma
- be aware of signs and symptoms of orthostatic intolerance
- be aware that a suspended Worker who is unconscious or has a head injury is particularly at risk of orthostatic intolerance
- be aware of factors that can increase the risk of suspension trauma
- ensure a medical professional is present when moving a Worker to a horizontal position following suspension
- use of rescue stirrups to allow suspended Workers to maintain blood flow
- rope/cable tenders shall make certain the harness user is conscious at all times

17.4 Fall Protection Equipment

Fall protection equipment shall meet the requirements of the CSA in Canada and ANSI in the US. All components of a fall protection system shall be compatible with one another and with the environment in which they are being used. Fall protection equipment shall be inspected by the Worker prior to each use. Re-certify and inspect fall protection equipment as specified by the manufacturer and Applicable Legislation.

Keep fall protection equipment free of substances and conditions that would contribute to deterioration. Fall protection equipment shall be destroyed if it is defective or if it contacts heat, chemicals or other substances that could cause damage. Fall protection equipment subjected to impact loading shall be immediately removed from service and shall not be used until inspected and determined by a Qualified Worker to be undamaged and suitable for reuse.

Personal fall arrest systems when stopping a fall shall:

- limit the maximum arresting force to 1,800 lbs. (8 kN) when using a full body harness
- not allow a Worker to free fall more than 2 m (6 ft.) or to contact a lower level
- limit maximum deceleration distance to 1.07 m (3.5 ft.)
- have sufficient strength to withstand twice the potential impact energy of a Worker free falling a distance of 2 m (6 ft.), or the free fall distance permitted by the system, whichever is less

Harnesses used for fall protection shall:

- only full body harnesses will be utilized and they must be rated for the employee's weight; Workers who exceed 140 kg (310 lbs.) (including body and tools) shall be required to wear a harness that is rated heavy duty and designed for their weight
- be selected for specific applications and consider:
    - compliance
    - potential arrest injury
    - suspension trauma
- have buckles that hold securely without slippage or other failure

Workers shall never be permitted to work alone in a harness when there is a fall potential of 2 m (6 ft.) or more.

It may be advantageous in some circumstances to locate the lanyard or tie-off attachment of the harness as near to the body's center of gravity as possible to reduce the whiplash and other trauma when a fall is arrested. This also facilitates moving legs upward and head downward while suspended.

Lanyards used for fall protection shall:

- be secured to an approved drop line, lifeline or fixed anchorage point
- have shock absorbers used with wire rope lifelines to keep fall-arrest loads below accepted limits
- allow for 100 % tie off or a self-retracting lifeline

Lanyards should be secured whenever possible above the waist or overhead to minimize actual fall distance.

Use a fall protection calculator to determine the length of lanyard required in a fall arrest system.

Where practical, the use of a retractable lanyard in place of a basic lifeline lanyard system is recommended.

Vertical and Horizontal Lifelines

Horizontal lifelines shall:

- be designed, installed, and used under the supervision of a Qualified person, as part of a complete fall arrest system, which maintains a safety factor of at least two
- have each Worker attached to a separate lifeline

Vertical lifelines shall be:

- provided for each Worker on Swingstages and work cages
- securely anchored each to an independent support so that failure of the equipment will not cause failure of the lifeline
- inspected before use
- protected from damage such as abrasion and chafing
- made of 5/8-in. polypropylene rope or made of other fibers of equivalent durability, impact strength and elasticity
- long enough to reach the ground

Where lanyards are used for horizontal travel restraint, anchor all lanyards to prevent lanyard-wearers from slipping over a roof edge.

Approved waist-type safety belts, with safety lines, shall only be used only for horizontal travel restraint as a positioning device (e.g., oil spill cleanup at water's edge). This type of safety belt shall not be used for fall arrest.

Approved safety lines (e.g., lifelines) and safety straps may be used for horizontal travel restraint or fall protection.

Secure each safety line independently to an approved structure of adequate strength.

Lanyards and lifelines shall be kept free of knots, as knots reduce the strength of rope.

Where lines attach to structures (and elsewhere as necessary), use softeners to protect against chafing or abrasion from contact with sharp edges.

Fall protection and travel restraint connecting hardware- such as carabineers, connectors and snap hooks shall:

- be self-closing and self-locking
- require two deliberate consecutive actions to open
- be marked with the manufacturer's name and the breaking strength

Safety Nets

Where safety net protection is required based on a hazard assessment, work shall not commence until the net is in place and has been tested in accordance with applicable requirements. Prior to using safety nets contact the safety department for review and assistance.

A professional engineer must certify any structure to which a personnel safety net is attached. The certification must indicate that the structure is capable of withstanding any load the net is likely to impose on it depending on the circumstances of the work site.

Safety nets shall:

- be installed and maintained so that the maximum deflection under impact load does not allow any part of the net to touch another surface
- have safety hooks or shackles of drawn, rolled or forged steel with an ultimate tensile strength of not less than 22.2 kilonewtons
- have joints between net panels capable of developing the full strength of the web,
- extend not less than 2.4 m (7 ft.) beyond the work area,
- extend not more than 6 m (18 ft.) below the work area

18.0 Control of Hazardous Energy Standard

18.1 Isolation

Only authorized Enbridge Employees shall perform initial de-energizing, isolation and energizing or lockout on Enbridge Operating Assets.

Contractors shall not de-energize, isolate or energize Enbridge Operating Assets.

All Lockout Procedures shall be documented and a copy kept as part of the project documentation.

Workers should consider all electrical conductors to be energized unless the conductor is:

- visibly isolated from the power supply; and
- tested to confirm it is de-energized, properly grounded and locked out

For electrical isolation of High Voltage or work upstream of the 480 V main breaker use the Electrical Equipment Isolation Work-Clearance Form.

For all other isolation activities use the Equipment Isolation Procedure Form

Lock/Out Tag-Out (LOTO) is required before performing certain activities, including but not limited to:

- when a Worker is required to remove or bypass any guard or other safety device;
- when a Worker is required to place any part of their body into a “point of operation”, “Line of Fire” or other danger zones that exist during a machines operation cycle
- the servicing and maintenance of equipment

Ensure that there is a continuity of LOTO protection. This includes transfer of LOTO protection between outgoing and incoming shifts to control hazardous energy. When energy sources remain isolated from a previous shift, the incoming shift members shall verify that the machinery is effectively isolated and de-energized.

If the locked out machine/equipment will not be worked on for more than 48 hours, replace all lockout locks with equipment locks. Before resuming work, replace equipment locks with lockout locks and verify isolation. For long term tank cleanings and tie in preparation, the isolation point becomes the lockbox. Lockout locks can remain on the multiple isolation points in the field as the lockbox will take over the function of the isolation point for the system.

Equipment locks will be utilized on the lockbox when work shall not continue for more than 48 hours. In this circumstance, when returning to continue work, use personal locks properly to ensure continued isolation.

18.2 Responsibilities

The Authorized Worker is responsible for the following:

- completing LOTO training and retraining requirements when required
- complying with Enbridge LOTO requirements and Applicable Legislation
- following LOTO procedures
- stopping and/or correcting LOTO work if procedures are not being followed
- acting as the Lockout Authority (LOA) when required

- isolating and locking/tagging out machines/equipment when it has been requested and coordinated for Contractors to perform work

Contractor Personnel shall not act as the LOA.

The LOA is responsible for the following:

- implementing and ensuring LOTO requirements are being followed
- implementing and following LOTO procedures
- performing or assigning a Enbridge designate (who shall be an Authorized Worker) to perform initial isolation of the work
- implementing the use of a lockbox or connecting equipment (e.g., scissor locks/hasps) when required
- ensuring all Authorized Workers working on the system lock out and tag out at the appropriate isolation point(s)
- verifying the isolation (tested to ensure it is under zero energy)
- ensuring an Equipment Isolation Procedure Form or Electrical Energy Isolation Form is completed
- coordinating and implementing complex group control (isolation over distance) when required
- assuming responsibility for managing changes (i.e., shift and/or personnel) and informing Workers (i.e., review and sign-off on the Equipment Isolation Procedure Form)

A LOA is required for every LOTO. For a one-employee LOTO, that employee automatically becomes the LOA. For a group LOTO (more than one employee), one Authorized Worker shall be designated as the LOA.

If the scope of work changes during isolation, the LOA shall immediately stop the work and review the validity of the isolation. Once the isolation is confirmed safe, the LOA may authorize work to resume.

Enbridge Regions shall conduct a written periodic inspection (at least annually) of each Authorized Worker, reviewing their responsibilities under this Standard. The periodic inspection of the energy control procedure is to ensure that the procedure and the requirements of this Standard are being followed.

18.3 **Locks**

Lockout equipment shall:

- be provided to the Authorized Worker as required
- not be used for purposes other than LOTO
- be capable of withstanding the environment in which it will be exposed for the maximum period of time that exposure is expected
- be substantial enough to prevent removal without the use of excessive force or unusual techniques (i.e., bolt cutters, metal cutting tools)

Contractors shall provide their Authorized Workers with LOTO equipment that meets the requirements of this Standard.

Tampering with any LOTO equipment is a serious offense and shall result in disciplinary action up to and including termination.

Type 1 – Lockout Locks

Lockout locks are personal/individual locks used for the protection of people. Enbridge employees shall use red locks. Lockout locks:

- shall be individually keyed, with one key per lock; and
- shall be kept in the control of the Worker who applies the lock or may set up communal personal/individual locks that are issued when necessary to Workers for use

Keys shall not be duplicated. Ensure locks are individually keyed with one key per lock that shall be kept in the control of the Worker who applies the lock(s) and removes their lock(s) when they leave the Worksite

Individual Workers performing maintenance on machines or equipment shall apply and remove their own personal/individual locks on the required isolation point.

Lockout Locksets

Lockout locksets shall be red in color. These locksets are used for the protection of people.

Lockout locksets:

- shall be keyed alike, with one key for the entire set
- shall be uniquely identified as being part of a set (e.g., each lock in a set of 10 lockout locks is engraved as LS#1)
- are commonly used in group LOTO situations, or a LOTO with multiple isolation points

Keys shall not be duplicated.

Additional information:

- more than one lockout lockset can be used during an isolation
- the LOA (or designate) is responsible for applying lockout locksets
- unused lockset locks shall be locked in the lockbox with the key, or temporarily removed from service
- a lockbox can be considered an isolation point during group lockout
- a Worker installing a lockout lock shall be the only person authorized to remove the lock and tag (except in cases where long-term isolation occurs, and later removal of the lock by another person is authorized by Enbridge

Type 2 – Equipment Locks

Equipment locks are used for protection of equipment. The locks may be any color other than red.

Equipment locks:

- are individually keyed or keyed alike for an equipment lockset
- are uniquely identified when part of a lockset
- may have multiple keys; the keys are issued to Workers in the department/location where the equipment locks are being used
- shall be used for:
    - long-term equipment shutdown (>48 hours)
    - out-of-service equipment

- isolations where a department is isolating the equipment but not performing the work (e.g., electrician isolating electrical components of a valve for PLM, Worker isolating equipment for a Contractor)

Performing maintenance on machines or equipment with just an equipment lock is prohibited.

18.4 **Tags**

Tags may be used to indicate which department or individual has isolated an energy source. A tag shall be attached to the shank of each lock used in a lockout by the Authorized Worker placing the lock. Tags shall:

- be designated for LOTO
- if written, be written so they are legible and understandable to others
- be constructed and printed in a way that ensure they do not deteriorate or become illegible
- be substantial enough to prevent inadvertent or accidental removal

All Authorized Workers shall be issued at least one photo ID tag. The tag is attached to a personal lock and shall, at a minimum, include the Worker's:

- photo
- name
- department or job title
- phone number

A generic personal tag can be used in place of a photo ID tag for Contractors or if the Authorized Worker does not have a photo ID tag available and shall, at a minimum, include the Worker's:

- name
- department or job title
- phone number
- date of application

Group tags can be attached to the shank of the lockset locks on the isolation points during a group lockout and shall, at a minimum, include:

- LOA's department
- Department contact
- Department contact phone number

Equipment locks shall have a durable tag or identifier appropriate for the environment and shall include:

- Worker name or department
- date of application
- reason for isolation

Any weathered or illegible tag shall be replaced.

18.5 **Additional Lockout/Tagout Equipment**

A variety of other LOTO equipment may be necessary.

Hasps/Scissor Clamps

Hasps/scissor clamps:

- are used to increase the number of locks that can be attached to one isolation point
- are commonly used when a Worker is isolating a piece of equipment that another Worker or group may also need to isolate
- are designed so they cannot be opened or removed until all locks are removed
- can be attached to each other (daisy chaining) to allow for additional locks at the one isolation point

Cables/Bars/Chains

In some situations, several energy-isolating devices may be locked near one another and shall be secured at the same time.

One approach is to use a lock to secure each energy-isolating device in its off or safe position. Another acceptable practice is running a cable, bar or chain through the lock points of the energy isolating devices (once they are in the appropriate position), then securing the cable, bar or chain against removal with a lock.

The strength and diameter of the cables, bars or chains used, combined with their routing or placement, shall:

- prevent their removal without tools; and
- keep the energy-isolating device in the appropriate position

There is no limit on the length of cable, bar or chain that is acceptable, or the maximum number of energy-isolating devices that may be secured at one time. However, the locking practices used must provide a level of Worker protection that is at least as good as if there was an individual securing device on each energy-isolating device.

Master Lockboxes

Lockboxes are used to simplify lockout procedures for group lockout. If an LOA isolates a system on behalf of a group for a safety lock-out, the LOA shall place the keys to the locks used to isolate the system inside a master lockbox and secure it closed with their personal lock. This lockbox is referred to as the master lockbox as it holds the master keys to the system. At this point, the master lockbox becomes the single isolation point of the system.

Each Authorized Worker required to work on the system shall place a personal lock on the lockbox. This ensures that the master keys cannot be removed from the master lockbox until each Worker removes his or her personal lock.

Authorized Workers shall be aware of the location of the master lockbox at all times.

Lockboxes shall be:

- lockable, sealable and readily identifiable
- used for one isolation at a time
- used to store the lockset key and any unused lockset locks

- able to accept a lock or a multiple lockout device, securing the box from unauthorized access
- free from damage

The LOA's personal LOTO is always the first on the lockbox and the last off of the master lockbox. The LOA's lock shall be placed at the securing point of the master lockbox.

Satellite Lockboxes

Satellite lockboxes may be used in conjunction with a master lockbox. Instead of having all authorized Workers LOTO at the master lockbox, Workers can LOTO at a satellite lockbox.

A satellite lockbox shall be set up by a crew lead, e.g., the crew lead attaches a personal lock to the master lockbox then places their key to that personal lock into a secondary lockbox, known as a satellite lockbox.

The Authorized Workers on a crew shall LOTO at the satellite lockbox. A master lockbox can have any number of satellite lockboxes linked to it.

The LOA's personal LOTO is always the first on the lockbox and the last off of the lockbox. The LOA's lock shall be placed at the securing point of the lockbox.

It is recommended that lockboxes used to store keys for equipment lockouts be a color other than red to prevent any confusion as to the purpose of the lockbox.

Lockboxes used to store keys for equipment lockouts should have documentation stored with the lockbox, or nearby, to enable Qualified Workers to determine what equipment is associated with the lockbox and why the equipment is locked out. Equipment lockboxes should be secured with a tag indicating that the lockbox contains a key(s) that is locking out a piece of equipment(s).

18.6 Isolation Points

Isolation may be single point isolation or multiple point isolation:

- Single point isolation – Isolation of machine/equipment from its hazardous energy source can be achieved through the lockout of a single, isolation device.
- Multiple point isolation – Isolation of machine/equipment from its hazardous energy source requires the lockout of more than one isolation device. This type of lockout is usually considered more complex.

Isolation devices used during LOTO shall be capable of being locked out; meaning a lock can be affixed or it has a locking mechanism built into it.

If locks cannot be physically installed on the isolation device, tags alone may be used. However, before a decision to use only tags is made, engineering changes that allow for the use of locks shall first be considered or attempted.

Before tags are used, the Site Supervisor shall be notified.

Tags used for tagout shall be placed at the same location as the isolating device. Tags shall have two parts, separated by a perforation:

- one part remains at the isolation point

- one part remains with the Authorized Worker who placed the tag (or, if group tagout involved, remains in a lockbox)

Tags shall include the following information:

- employee or crew name
- employee or crew contact information
- work performed
- notation that this is a tagout

If a lockbox is not used, each Authorized Worker shall personally place and remove their tag to the required point(s).

Isolating for Other Work Groups

If an Authorized Worker is isolating machines/equipment for an internal work group but not performing the work themselves (e.g.,, electrician locking out for a mechanic), they may use equipment locks at the isolation points. The working group is responsible for applying lockout locks to the isolation points.

An Equipment Isolation Procedure Form is required for all lockouts that fall within the scope of this Standard.

Procedures may be developed when the isolation procedure is consistent e.g., pigging. If a procedure has not been developed, the LOA is responsible for ensuring one is developed prior to the start of work.

The Equipment Isolation Procedure Form shall be available to all Workers performing the lockout during the isolation work.

18.7 Piping Isolation Methods

Double blocking and bleeding involves the use of a 3-valve system in which a pipe has two closed valves and an open drain valve positioned between them so material is prevented from flowing and is re-directed in case of a valve leak.

Double block and bleed methods are to be used whenever reasonably practicable.

When used, a double block and bleed shall be located directly upstream of the work area. If a flow in the pipe can come from more than one direction, a double block and bleed is required on each upstream side. The valves of a double block and bleed system shall be secured to ensure an acceptable level of safety, and leak tested to ensure that the valves are holding.

Blanking involves inserting a physical barrier through the cross-section of pipe so material is prevented from flowing past that point. Blanks shall be of sufficient rating to withstand the highest possible pressure that may result.

Blinding involves disconnecting a pipe and attaching a physical barrier to the end so material is prevented from flowing out of the pipe. Blind flanges used for this purpose shall be of sufficient rating to withstand the highest possible pressure that may result.

In some circumstances, it may not be reasonably practicable to use the above-noted piping isolation methods. If so, an alternative means of isolation shall be implemented and shall adequately protect Workers.

Additional isolation methods of hazardous energy include, but are not limited to, the following:

- rotating equipment isolation – pockets and cavities potentially containing pressure after isolation shall be checked and relieved of pressure before work starts
- gravity and piping under stress isolation – (suspension or tension) use stoppers, chains, ropes and/or cribbing to prevent unexpected movement of any parts or components
- nuclear source isolation – isolation and any work on nuclear source radiation shall be in accordance with Enbridge procedures

18.8 General Isolation Steps

1. Shutdown Preparation

- Identify type, magnitude and control methods of hazardous energies present
- Identify and locate all potential energy sources to be isolated:
  - review the scope of work
  - review drawings, if applicable
  - visually inspect equipment components being worked on to verify drawings
- Determine required LOTO equipment
- Obtain or develop safe shutdown procedures for machines/equipment to be LOTO.
- Prepare the Equipment Isolation Procedure Form

2. Notification

- Notify affected Workers that a lockout will be in effect and explain reason for lockout
- Notification ensures that Workers do not attempt to reactivate machines/equipment during LOTO
- If the work being completed involves the LOTO of equipment (i.e. valves, piping, etc.) that affects the flow path that the Edmonton Control Centre is responsible for controlling or operating, then a copy of the Equipment Isolation Procedure Form shall be sent to the Edmonton Control Centre Operator prior to the work starting.

3. Shutdown

- Shutdown operating equipment to be LOTO in accordance with the safe shutdown procedure
- Ensure additional hazards are not created during shutdown

4. Isolation

- Complete the Equipment Isolation Procedure Form
- Isolate equipment from its energy source by operating switch, valve or other energy-isolating device to appropriate position
- Isolation may be single or multiple points

5. Application of LOTO

- Lock and tag isolating device in a safe, secured position to prevent accidental movement of device

- Each Authorized Worker performing work directly on the pipe or machine/equipment being serviced/maintained shall personally attach a LOTO device to required isolation points. The isolation point in a group LOTO may be a lockbox
- Workers cannot attach a personal LOTO device for another employee
- Any affected Worker (including support personnel and visitors) has the right to apply a lock, provided they have authorized Worker training.
- Workers or groups performing work independently of main isolation but impacting isolation points shall clear additional locks with LOA.

6. Stored Energy

- Relieve, disconnect, restrain and/or render safe potentially hazardous stored or residual energy.
- If re-accumulation of stored energy is possible, verification of energy isolation shall be continued until servicing or maintenance work is completed or until hazard no longer exists.

7. Isolation Verification

- The LOA (or designate) shall verify (test) that lockout is effective by confirming that the system is under zero energy.
- Before verification tests, Workers shall be located in a safe area away from machines/equipment being tested.
- For examples of verifications methods, see Table 1(confirming that locks are physically placed in correct locations is not an accepted form of verification).
- If zero energy is not feasible, regional management shall review and approve work procedures.
- Verification shall be performed before starting work and at shift change.
- Authorized Workers shall be confident the isolation has been verified before starting work and can request to see or perform a test at any time to confirm the isolation.

8. Servicing / Maintenance

- Proceed with servicing/maintenance on the machines/equipment that have been LOTO.

Removing Isolation and Restoring Equipment

1. LOTO Release

- Inspect and clear work area of tools and equipment.
- Notify affected Workers in startup area that equipment will be re-energized.
- Each Authorized Worker shall remove their own LOTO device.
- LOA shall ensure all Workers are in a safe location prior to removing their locks.
- LOA shall remove LOA locks applied to isolation points.

2. Re-energization

- Return isolating devices (e.g. switches, valves) to appropriate operating position.
- If safe, restore energy to machine/equipment.
- If the work completed involved the LOTO of equipment (i.e., valves, piping, etc.) that affected the flow path that the Edmonton Control Centre is responsible for controlling or operating, contact the Edmonton Control

Centre Operator prior to re-energizing the system to ensure the affected valves are in the appropriate position and an open flow is maintained

18.9 Authorized Removal of Locks

The Lock Removal Authorization Form applies to both lockout and equipment locks and shall be used if any of the following occurs:

- a safety or personal lock has been abandoned
- a key has been lost by a Worker or work group
- an emergency situation develops
- removal of an equipment lock without an equipment isolation form or log sheet documenting who installed the lock and why the equipment was locked out

The lock cannot be removed until all abandoned lock removal procedure steps have been performed.

Unauthorized removal of a personal, safety, or equipment lock by anyone other than the Worker to whom it belongs, is prohibited.

18.10 Contractor

Enbridge's Authorized Workers shall use Enbridge LOTO equipment to isolate all required energy sources. The isolation of these sources shall occur before Contractors perform any activities related to servicing and/or maintenance of machines/equipment at an Enbridge Worksite.

Contractors shall develop and implement their own LOTO procedure and policy to ensure Worker and equipment protection and to meet Enbridge requirements and all Applicable Legislation. As a minimum, each Worker working on equipment that is affected by a lockout shall install their own lock and tag at the isolation point (s) prior to starting work. Contractors shall provide their own equipment (i.e., personal locks) for their lockout portion.

Contractors performing LOTO can follow one of the following methods:

- A Enbridge Authorized Worker attaches lockout locks and tags to the isolation points, place the keys in a lockbox and attaches an equipment lock to the lockbox. The Contractor then attaches their LOTO equipment to the lockbox.
- A Enbridge Authorized Worker attaches a hasp/scissor clamp and equipment lock and tag to each isolation point. The Contractor then attaches their LOTO equipment to each isolation point and follows their LOTO program (e.g., setting up a satellite lockbox for the rest of their crew)

Once the LOTO has been completed, an Enbridge Authorized Worker verifies that the isolated equipment is at a zero energy state.

If Contractor personnel would like to verify isolation, they shall be afforded the opportunity to do so.

Contractor personnel who leave the worksite shall remove all of their locks and tags from the isolations point(s).

For new construction isolation turnovers or tie-ins into pre-existing systems, all affected parties shall communicate the status of the equipment being turned over.

Enbridge in conjunction with the Contractor shall develop and document specific lockout procedures for complicated multiple lockouts and/or complex electrical lockouts before work commences (e.g., major lockout for a meter manifold system or high voltage lockout in a substation).

The Contractor will develop a specialized testing procedure that ensures positive isolation of the testing equipment from all other work areas.

The commissioning Contractor shall have a checklist in place that identifies all points to be energized or isolated.

18.11 Complex Group Control Process

In some cases, it may not be reasonably practicable to use an individual/personal or group lockout process. To maintain Worker safety, normal group lockout practices may need to be adapted or modified into what is referred to as a Complex Group Control Process (CGCP). This process is implemented and coordinated by the LOA.

One example of a reason to use a CGCP would be if the machinery, equipment and/or pipeline occupies such a large area, or multiple areas, that it becomes impractical for the LOA to personally secure all energy isolation devices. In such a scenario, some of the devices in a complex group control may need to be isolated and secured by another Worker (e.g., control room operator) due to the distance between the work area and the isolation devices.

A copy of the Equipment Isolation Procedure Form shall be forwarded to the remote site's Authorized Worker prior to isolation and lockout. The LOA shall document and verify secure and effective isolation through direct communication with the Authorized Worker who completed the isolation with lockout locks at the remote site.

Any of the following methods may be used to achieve control of the keys used in the isolation at the remote site:

- if there is one Authorized Worker completing the isolation at the remote site, they can maintain control of the key(s)
- if there are more than one Authorized Workers at the remote site, a lockbox or hasp/scissor clamp shall be used to control the isolation point keys
- the keys to the locks can be brought to the location where work is being performed, then placed and secured in a lockbox at the work area

The LOA can begin coordinating the return-to-operation process only when all personal locks have been removed by the Workers at the work area and the remote site.

19.0 Material Handling Standard

19.1 Classification of Lifts

Critical Lifts

The Workers involved in a critical lift shall apply the required controls and any other appropriate measures to ensure the safe and effective execution of the lift.

Lifts classified as Critical Lifts include:

- any single crane lift, when the load is greater than 75% of the manufacturer's rating chart
- any tandem lift (multi-crane lift) involving two or more cranes lifting the same load simultaneously, when the load may exceed more than 75% of the lifting capacity of any one crane, as measured on the manufacturer's rating chart
- any lift where the load travels over or between overhead high voltage power lines (this does not include cables in cable trays)

The minimum control measure required for all critical lifts is the completion of an Engineering Lift Plan (ELP). The ELP shall include all details and lift calculations for the lift, including scale drawings showing configurations and clearances.

A Qualified Lift Engineer shall visit the site of the lift to familiarize themselves with all above and Below Grade Facilities. The ELP shall be signed and approved by a Qualified Lift Engineer or Qualified Rigger/Rigging Specialist.

A Qualified Rigger/Rigging specialist is a person deemed to be appropriately qualified in the preparation and development of lifting studies. The certification documentation for a Qualified Rigger/Rigging specialist, either from an external provider or internally provided by the rigging specialists employer, shall be made available to a Enbridge Representative upon request. A certified Operator shall be used in jurisdictions that don't certify Riggers.

The ELP shall be reviewed and agreed to by all Workers involved in the lift (e.g., crane operators, Riggers/Rigging Specialists, and Site Supervisors) at a pre-lift meeting.

Serious Lifts

The Workers involved in a serious lift shall apply the required controls and any other appropriate measures to ensure the safe and effective execution of the lift.

Lifts classified as Serious Lifts include:

- any crane lift where Workers are being hoisted in a man-basket
- any lift where failure of the lift could endanger existing Facilities of one-of-a-kind equipment or processes
- any load where special lifting or rigging equipment configurations are used
- any lift where the load or any part of the lifting equipment could come within the safe limits of approach to high voltage equipment or a power line
- any lifts over existing permanent structures
- any blind lift

For each serious lift, the minimum control measure required shall be completion of a lift plan. The lift plan shall be reviewed and agreed to by all Workers involved in the lift (e.g., Operators, Riggers/Rigging Specialists, and Site Supervisors) at a pre-lift meeting.

At a minimum, the information recorded on the lift plan shall include weight, radius, crane type, percentage of chart, rigging components and rating capacities. Those involved in the review of the lift plan shall sign the document.

The placement of trench boxes, sleeves and sheet piles over operating assets does not constitute a critical or serious lift.

Standard Lifts

A Standard Lift is any lift that is not classified as serious or critical.

A Standard Lift shall be documented on the Operator's Log Entry or Lift Calculation Sheet. This shall include records of weight, radius and percentage of chart for each lift, or for a series of lifts from a single location.

For all lifts, the following factors shall be considered or determined, including any related, appropriate control measures:

- percent of crane capacity
- weight of the load
- any change or transition of critical Workers, as identified in the lift plan
- ground conditions
- compaction
- overhead lines, obstructions, etc.
- underground equipment or hazards
- trajectory of load if dropped (i.e., determine the potential drop zone)
- electrical equipment in the area, e.g., nearby conductors
- weather conditions
- outrigger and track loading
- matting
- process operations; local process hazards
- Workers near the lift area
- multi-lift plans

Additional controls may be required, given the exact nature of the lift to be performed.

19.2 Preparation, Operation and Responsibilities

A pre-lift meeting shall be held to:

- identify the Qualified Rigger/Rigging Specialist and Signaler/Spotter
- review the job specifics and hand signals prior to any lift operation

Only Authorized and Qualified Operators that are thoroughly familiar with the equipment are permitted to operate lifting equipment, including cranes.

Intern or Apprentice Operators are permitted to operate equipment once hoisting and rigging training has been completed, but only under the supervision of a Qualified Operator.

Upon request, a crane Operator or Rigger/Rigging Specialist shall provide documentation of training records and certifications. Rigger/Rigging Specialist shall have experience consistent with the requirements of the lift to be made.

A crane shall not be erected when ground conditions are not stable or safe enough to allow for stable/firm placement or installation of the crane.

Prior to performing any lift, the Operator shall:

- review the Hazard Assessment and/or the ELP
- determine the weight of the lift (including the load and rigging)
- test the safety devices of lifting equipment, where applicable
- ensure that the lifting device and all components are of sufficient size and strength to support the weight of the load, and that they do not exceed the manufacturer's ratings under any circumstances
- ensure tag lines are used when rotation or swinging of the load is hazardous, or when the load needs guidance
- under any operating conditions, ensure that the planned lift does not exceed the manufacturer's recommendations
- perform daily equipment inspections to verify that the lifting device and all components are in safe working condition; also maintain a written record or log book of these inspections
- ensure equipment (e.g., boom) stays within the safe limits of approach to electrical lines and conductors, in accordance with the Hazard Assessment process and/or Lift Plan
- ensure procedures applicable to the operation of the equipment are readily available in the cab at all times; including a permanently-attached load and radius chart that can be easily read by the Operator from their operating position
- possess and keep available for inspection, an Operator's license or certificate
- replace any obscured, damaged or missing warnings, operating instructions or capacity instructions that are normally attached to the equipment
- repair or replace any deficiencies or defective parts before using equipment
- not allow Workers on the load when the load is in motion

A Qualified person shall:

- visually inspect all material lifting equipment (including tank davits) and machinery prior to and during each use, to ensure it is in safe operating condition
- replace any obscured, damaged or missing warnings, operating instructions or capacity instructions that are normally attached to the equipment
- repair or replace any deficiencies or defective parts before using equipment
- remove the equipment from service if there are deficiencies or defective parts that cannot be repaired

Additional Pre-Lift Requirements

Follow these requirements when preparing for the lift.

- Use barricades and warning signs as necessary, to control traffic in the work area.

- Fully extend outriggers and position them on a firm base, to provide adequate support prior to any lift or booming operation.
- All machine ratings are based on the machine being level in both directions, with outriggers extended. If this is not possible, the Operator shall take this into account when loading and handling and de-rate as necessary
- Secure loads over 3.6 m (12 ft.) long at a minimum of 2 points (see Figure 1), depending on load distribution and load shape.
- Remove or secure loose materials, parts, blocking and packing from the load.
- Remove obstructions from the area before lifting or moving a load.
- Attach the load to the hook by slings or other approved lifting devices.
- Set up to rig the hoist directly over the load. If the load is not positioned correctly it may swing, causing the hook or frame to bind or damage the hoist device.
- Ensure the hoist is free to swivel on hooks. Ensure the Safe Working Load (SWL) of the hoist does not exceed the SWL of the supporting structure.
- Ensure the load chain or hoist cable is free from kinks and twists, and is not wrapped around the load.
- All lifting devices shall be properly assembled using the appropriate rigging component as required for the intended lift (e.g., four-part line vs. a two-part line).
- The load, sling, lifting device and load block shall clear all obstructions.
- Identify and mark the swing radius and review the lift zone and all potential drop zones
- Ensure a test lift is conducted to assess the center of gravity so that rigging can be re-positioned as needed

During the lift, tag lines shall:

- be used in accordance with the manufacturer's specifications for the rigging, component parts and attachments
- be knot-free
- be of appropriate length to control the load
- be appropriate for the pipe or material and the purpose of handling it
- be used only to perform the function for which it was intended or designed
- be inspected before each use and removed from service if defective
- be used to stabilize the load, minimizing swing, which can impact the SWL
- be used to protect Workers from putting hands on the load, and from positioning themselves beneath or in close proximity to the load

During the lift, tag lines shall NOT:

- be used if they create an unsafe condition as determined by the Hazard Assessment
- be wrapped or secured in any form to a Worker

Always use two tag lines where rotation or uncontrolled motion of a load being hoisted is anticipated.

During the lift, the Operator shall follow these requirements:

- Check the brake when lifting the load above ground level; if there is any slippage, stop the operation. The brake shall be repaired or replaced before the equipment is returned to service.
- Do not move, carry or swing loads over the head of any Worker.

- Do not allow Workers to be under the load, or between the load and a stationary object.
- If possible, identify the hazardous area (drop zone) by marking the swing radius in congested areas.
- Avoid traveling with loads suspended, whenever possible. If travel is necessary, carry the boom in line with the direction of travel and ensure tag lines are used to control the load swing.
- Keep loads as close to the ground as reasonably possible.
- Remain at the controls while loads are suspended. If it is necessary to leave the controls, the suspended load shall be secured, e.g., skidded or blocked up. All locking and safety devices shall be set, as necessary, to safely secure the machine.
- Ensure the hoisting line is in a vertical position and over the center of the load, in such a manner as to reduce danger to Workers from a swing or uncontrolled movement of the load. Dynamic loading impacts the capacity of the crane
- Ensure tension is maintained on the rigging and that the rigging is not unhooked until the load is fully secured.

Workers shall:

- stay clear of the load being lifted
- not walk or pass under a suspended load
- not come between the load and a stationary object
- never hold any part of the load, rigging or lifting equipment while the load is suspended and/or in motion
- maintain a safe distance from the load until the tension on the rigging is relaxed and the load is stable

Qualified Signalers/Spotters

- where a Signaler/Spotter is required, they shall be Qualified in crane and hoisting hand signals (refer to section 12.11) and shall have completed any specific training required by Applicable Legislation
- in the event that the equipment Operator cannot see the load or the Signaler, the Lift Plan shall determine the means of constant communication that shall be used
- the Signaler shall wear a gauntlet or other unique means to identify them as the designated Signaler

Pipe Handling Operations

Workers shall be trained to safely handle and secure pipe and materials.

Follow these requirements:

- Ensure the appropriate lifting equipment is used, i.e., side booms, track-hoes equipped with vacuum devices and cranes.
- Ensure pipe and fittings are handled using only approved rigging equipment designed not to damage the load, i.e., Teflon or brass insert stringing pipe hooks (sorting hooks) and nylon slings.
- Whenever possible, place pipe or materials in a flat area or parallel with a slope, rather than across a slope.

- Secure pipe or materials from movement by blocking, cradling, or a combination of both, or use an approved alternative method (see Figure 2).
- Ensure pipe blocks have sufficient strength to hold the weight of the load.
- Secure pipe blocks to prevent loads from being removed or dislodged. Skids are considered to be secured if the weight of the pipe or barrel prevents the skid from being dislodged or removed (see Figure 2).
- Ensure cross timbers are placed approximately 1 m (3 ft.) from the ends of the pipe.
- Stand clear when cutting steel bands or wire that secures a load of pipe to a vehicle or rail car.
- Keep hands clear of pipe-ends when pipe is being butted together.
- Use tag lines.

Ensure pipe that is being stored (e.g., in populated areas, or at road crossings) is equipped with end caps or secured to prevent unauthorized entry.

19.3 **Cranes**

Workers shall suspend crane operations when:

- the wind velocity at the elevation of the crane exceeds the limit specified by the manufacturer, or
- the ambient temperature is below that specified by the manufacturer

Follow manufacturers' specifications in regard to reduced ratings or capacities of the crane under specified temperatures.

Crane Operators shall follow these requirements:

- Lower crane booms with the winch engaged, not by brake alone.
- Maintain the safe limits of approach to any utility at all times.
- When a crane or boom truck is traveling around the site, ensure booms and knuckles are in a proper resting position, to avoid damage or hazards, such as overhead power lines or cable trays.
- Ensure an unloaded boom has the empty hook lashed or otherwise restrained so that it cannot swing freely when in motion.
- Ensure the boom attachment, when in motion, is not positioned at more than 30 degrees from the vertical position.
- Avoid two-blocking, which may cause the load line to fail. Cranes shall be equipped with an anti-two-block warning device.
- On pipe layers and side booms, check the functioning of the boom cut-out valve daily.

A power-controlled lowering system shall be provided and shall be capable of handling rated loads and speeds as specified by the manufacturer of the crane. When power-operated brakes that have no continuous mechanical linkage between the actuating and braking means are used, an automatic means shall be provided to set the brake to prevent the load from falling in event of loss of brake-actuating power.

Loads carried on boom trucks shall:

- be adequately secured, including the battery on the side boom (to prevent movement in the event of a roll-over)
- not be secured by using the boom lines

Side booms shall:

- not be loaded beyond manufacturer's specified capacity
- not have the counter weight supplemented by the use of equipment or other devices
- have a seat belt which shall be worn by the operator when the side boom is in use
- be equipped with ROPS certified by a professional engineer
- have adjustment of brake tensions performed by a licensed heavy duty mechanic, in accordance with the manufacturer's specifications

19.4 Using Excavation Equipment for Lifting

When using excavating equipment (e.g., gradalls, backhoes) for material lifting, follow these requirements:

- The Operator shall know the weight of the load being lifted. The load shall not exceed the manufacturers' specifications on the lifting capacity of the equipment.
- The Operator shall have the Lifting Capacity Chart for the specific piece of excavating equipment and it shall be permanently affixed to the machine and legible.
- Excavating equipment used for lifts shall be equipped with a factory-supplied lift point, e.g., a welded plate with an eye, or a bolted-on hook with a safety latch.
- Operator shall have a magnetic particle inspection report, dated within the previous 12 months. The report shall certify the fit condition of the lifting point and its method of attachment, e.g., welds, bolts.
- The Operator shall visually inspect the lifting point before each lift.
- Bolts used to attach hooks or other attachment points shall be rated higher than the lifting capacity of the lifting equipment.
- Slings shall be connected to the lifting point of the load with a clevis or shackle.
- Unattended loads shall be lowered to the ground or blocked in position.
- The load being raised shall not exceed the lifting capacity of the lifting components.

When exceeding 75% of the excavating equipment's lifting capacity as determined by the manufacturers' specifications, additional controls shall be required, including a formal lift plan.

Hydraulic systems on excavating equipment are subject to hydraulic drift and are not designed to hold materials unless the materials are in motion. If materials are held in place, uncontrolled descent of the lifting arm or lifting mechanism may result from a failure in the hydraulic system, because it is unlikely to be equipped with emergency lock safety check valves.

The placement of trench boxes, sleeves and sheet piles by excavating equipment over operating assets does not constitute a critical or serious lift.

19.5 Inspection and Maintenance

All lifting equipment shall be installed, operated, inspected, maintained and repaired according to the manufacturer's specifications.

To minimize breakdowns and prolong equipment life, a written inspection and maintenance program for lifting equipment shall be in place to ensure that equipment and components are in safe operating condition.

Contractors shall have written documentation that verifies that the maintenance program is in place available to an Enbridge Representative upon request.

All load bearing components shall undergo non-destructive testing, under the direction and control of a professional engineer and in accordance with the manufacturer's specifications.

Equipment shall be inspected before each use.

Follow these additional maintenance and inspection requirements:

- the Manufacturer's specifications shall be followed when assembling/disassembling equipment, under the direction of a Qualified Worker
- modifications or additions that may affect the capacity or safe operation of the equipment shall be made only with the written approval of the manufacturer or a registered professional engineer
- log books are required for each lifting device

All written records including all certifications, maintenance records, and inspection records for lifting equipment, e.g., cranes, hoists, side booms shall be retained and made available to an Enbridge Representative for review upon request.

Follow these requirements for inspections:

- for equipment in normal service, inspect at least once per year, or as specified by the manufacturer
- for equipment in Heavy Service, inspect at least every 6 months, or as specified by the manufacturer
- for equipment that is idle for 6 months or more, inspect prior to use
- for vacuum lifts, inspect 3 times daily, to ensure the integrity of the equipment
- all pipe vacuum lifts shall have inspection certification
- hoists, cranes and lifting structures that are to include hooks in accordance with the manufacturers' specifications' shall be inspected at least once annually by a certified inspector

19.6 **Requirements**

Material lifting structures, hoists and rigging components shall be clearly marked with the SWL.

Markings shall:

- appear on the load block trolley and on both sides of the material lifting structure
- be legible
- be clearly visible to the operator and everyone involved in operating the equipment

The recommended colour for markings is black.

19.7 **Hoisting and Rigging**

Jacks shall:

- only be used for temporary support of loads
- be supported by a firm foundation
- not be used at an angle; as needed, use blocking and shims to build a level support for the jack or to support heavy loads

If using jacks, lift loads from one end at a time not from side to side.

External hydraulic jack pumps shall be positioned a safe distance from the load being lifted.

Discard or repair jacks (in accordance with manufacturers' specifications) if visual inspection reveals any of the following:

- hydraulic fluid leaks
- thread damage
- scoring or other damage to the ram
- excessively loose or frozen swivel heads
- damaged end caps
- cracks or other damage to the housing
- loose bolts or rivets

When blocking and cribbing, Workers shall:

- use hardwood timber
- use solid layers of timber for heavy loads
- as needed, use steel or hardwood mats under cribbing to spread the bearing pressure evenly (e.g., if the ground has insufficient load bearing capabilities)

To ensure stability in cribbing, the height of cribbing should not exceed the length of the cribbing material.

Before inspecting hoist chains, remove any load; then, clean the load and hand chains.

Inspect chains link-by-link (see Figure 3) for:

- nicks
- gouges
- twisted links
- excessive wear or stretching

For worn load and hand chains, gauge them throughout their entire length. If found to be beyond serviceable limits, replace links as specified by the manufacturer.

Hooks

Hooks shall not be overloaded. Applicable hooks shall be fitted with a safety latch before being placed in service.

The hook's safety latch shall:

- be closed, and shall not support any part of the load (See Figure 4)

- not be damaged or bent
- operate with enough spring pressure to keep the latch tightly against the top of the hook
- spring back to the top when released

Hooks shall be inspected annually using one of the following non-destructive testing methods:

- x-ray
- magnetic particle
- dye penetration

It is not necessary to inspect hooks that have not been used since the last inspection. Unused hooks shall be marked by covering the ends of the hook with tape after inspection; the tape can be removed when the hook is used.

Replace hooks (including the nut) if the any of the following (see Figure 4) conditions are observed:

- cracking
- excessive wear/deformities/twisting
- 15% or more throat opening
- 10% twist out of the normal hook plane

Approved pipe hooks (sorting hooks) with Teflon or brass inserts that are designed without safety latches are exempt from the requirements outlined immediately above (See Figure 5).

Slings and other devices shall be the correct size for the hook and shall be seated in the saddle of the hook (see Figure 6).

Securely attach the hoist's hook to the trolley.

Slings, Chains, Ropes, Cables

All manufactured slings shall:

- use softeners where sharp corners contact the sling (see Figure 7)
- be at a 45° angle or more (see Figure 8) when slings are used to lift a load
- be flat (i.e., not twisted, kinked or knotted) while in use
- be hitched in a way that provides control of the load
- avoid shock loading
- not be dragged on the floor or over abrasive surfaces
- not be pulled from under a load when the load is resting on the sling
- be stored out of the elements (sunlight, rain, snow, etc.) and in accordance with manufacturers' specifications

Follow these additional requirements:

- Wire rope and synthetic web slings shall be cleaned before storing and stored in a protected area, such as a storage rack (see Figure 9).
- Wet rope slings shall be hung up to dry, or laid in a loose coil in a dry place and away from ultraviolet rays. Do not allow wet rope slings to freeze.

Use of a synthetic web sling in a chemical environment meets manufacturers' specifications for use. Synthetic web slings are lengthened by joining slings with a shackle, or looping them through eyes instead of knotting two slings together

A designated, Qualified Worker shall inspect slings before use. The Worker shall also ensure slings and accessories:

- have not been damaged in storage or shipment
- are clearly labeled and/or tagged
- are rated for hoisting, indicating the manufacturer's ratings and the safe working limits
- are the correct type and have the proper capacity rating for the application

The designated Qualified Worker shall ensure defective slings and accessories (e.g., worn, frayed, kinked, twisted, or showing signs of damage or excessive wear) are removed from service, tagged, and repaired or discarded if they cannot be repaired.

Inspection records shall be kept for each sling including:

- sling identification information
- dates of periodic inspections
- comments regarding the condition of the sling at the time of the inspection

Wire ropes on electric hoists shall be inspected to confirm:

- hoisting ropes are secured to the drum by at least 2 wraps when the hook is in the lowest position
- winch lines are free of knots
- the number and spacing of clips conforms to manufacturers' specifications

Follow the SWL for wire rope slings shown in Table 2. Figure 10 shows the methods of attaching rope to the fittings.

Guards shall be used:

- if hoisting ropes run close enough to other parts to make fouling or chafing possible
- when exposed moving parts and rotating equipment which might constitute a hazard under normal operating conditions

Follow these requirements in relation to tank davits:

- In normal service, tank davits shall be inspected (using the tank davit checklist) at least once per year.
- A tank davit that has had major alterations or modifications shall be approved before its next use. Approval shall be provided by a professional engineer who shall load-test and certify its capacity.
- When used for rescue purposes, the tank davit shall use the Rollgliss to lift or lower a Worker. A tank davit used for rescue shall be inspected according to the manufacturer's specifications.
- Use manual hoisting equipment (e.g., snatch block) when lifting or lowering equipment.
- Do not, under any circumstances, substitute powered lifting equipment (e.g., electric or hydraulic winch) for a Rollgliss or snatch block.
- The SWL of a tank davit is 180 kg (400 lb.). The davit arm shall have the appropriate placard indicating the rating.

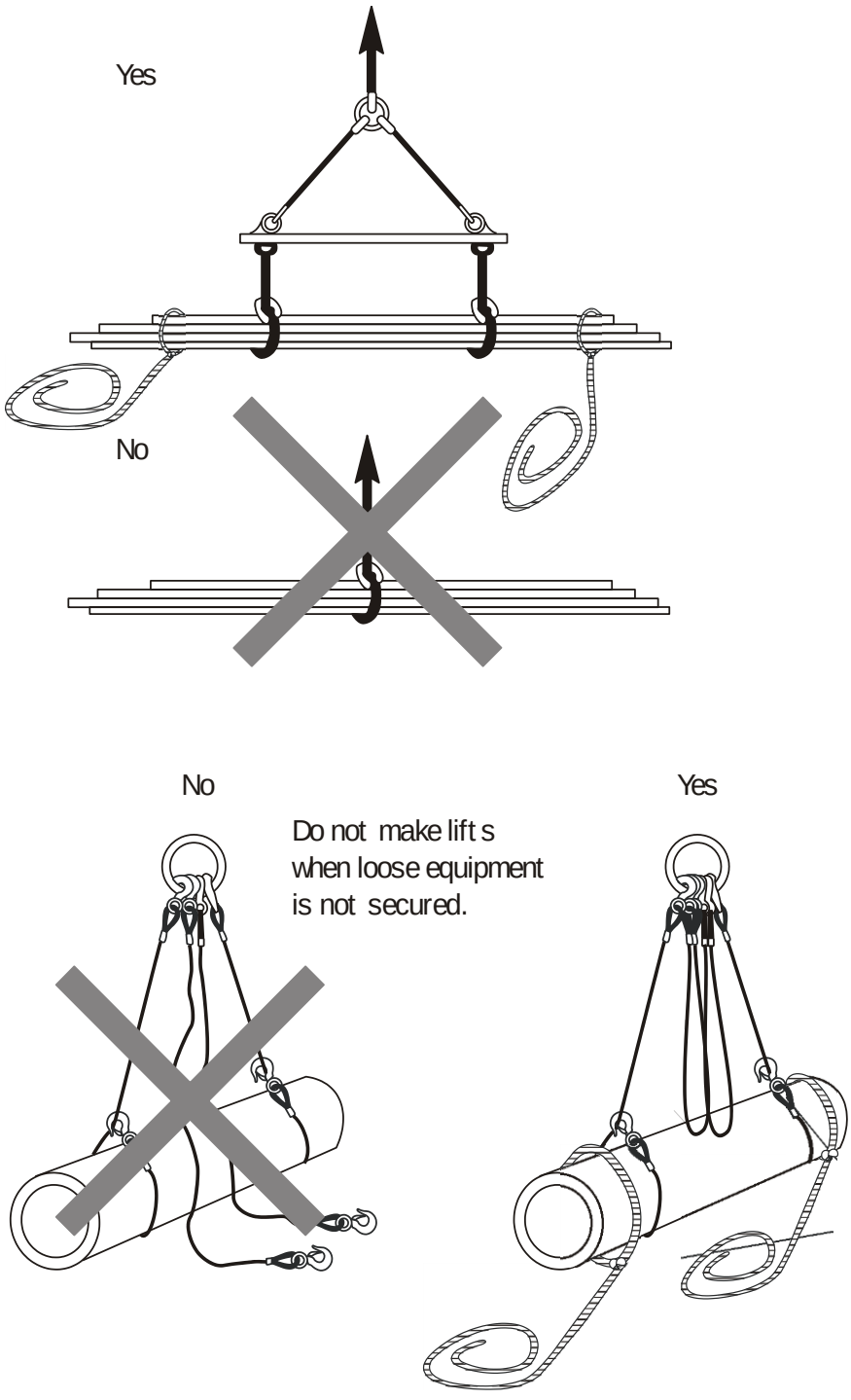
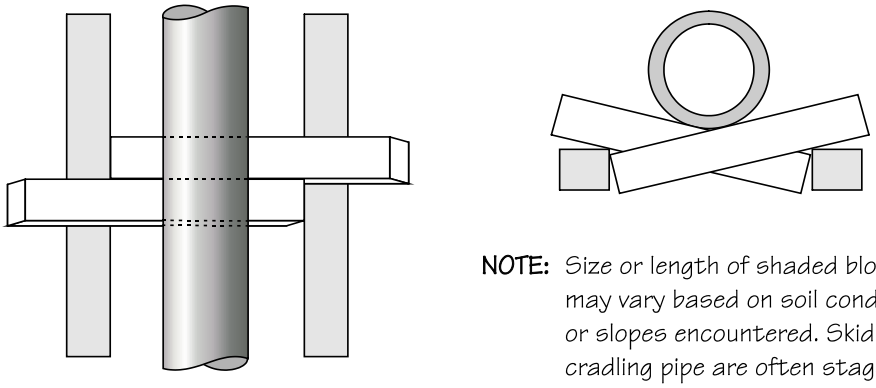


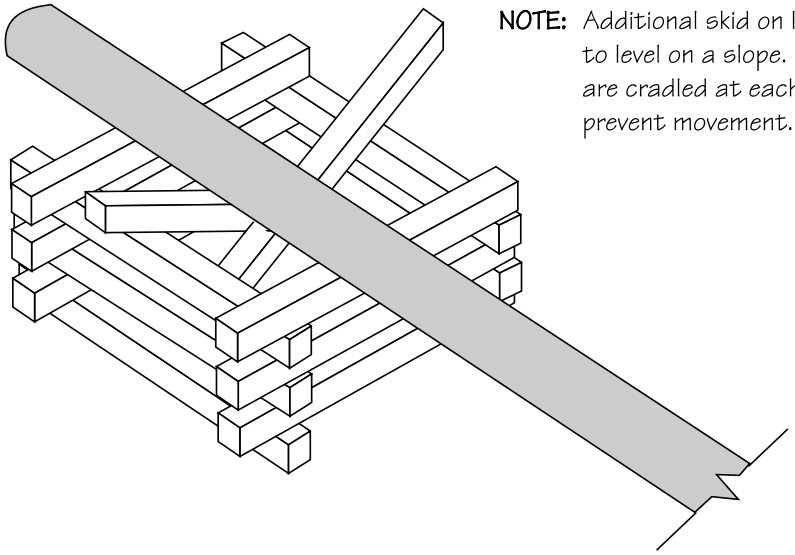
Figure 1- Lifting Loads Over 3.6 m (12 ft.) in Length

Cradling



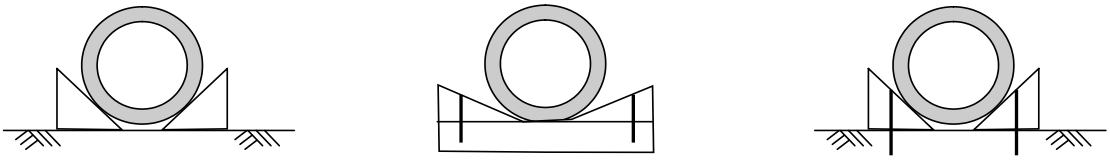
NOTE: Size or length of shaded blocks may vary based on soil conditions or slopes encountered. Skids cradling pipe are often staggered.

Cradling Pipe Above Ground



NOTE: Additional skid on left side to level on a slope. Pipes are cradled at each end to prevent movement.

Some Alternatives for Securing Pipe Blocks



Secured by the Weight of the Pipe

Secured to Skid

Pinned to Earth

Figure 2- Handling and Securing Pipe Examples

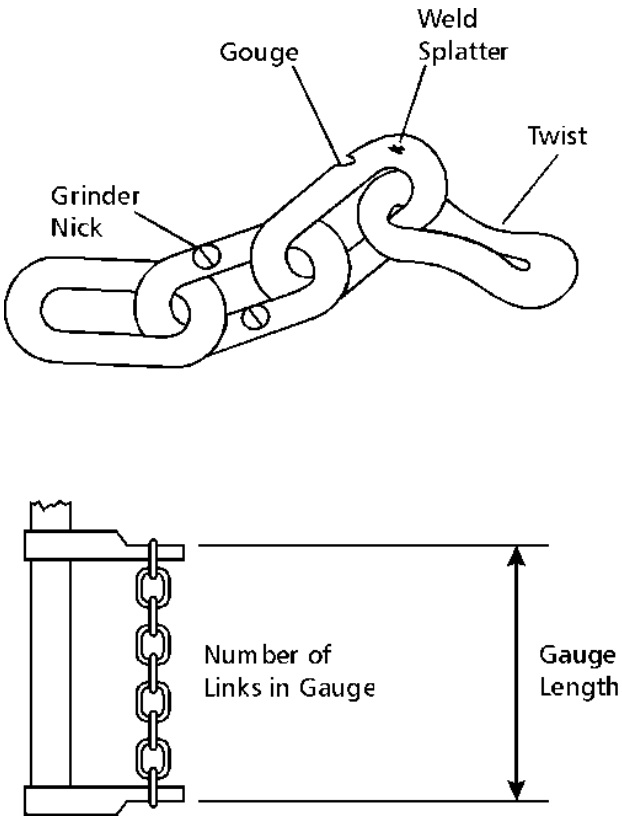


Figure 3- Chain Defects

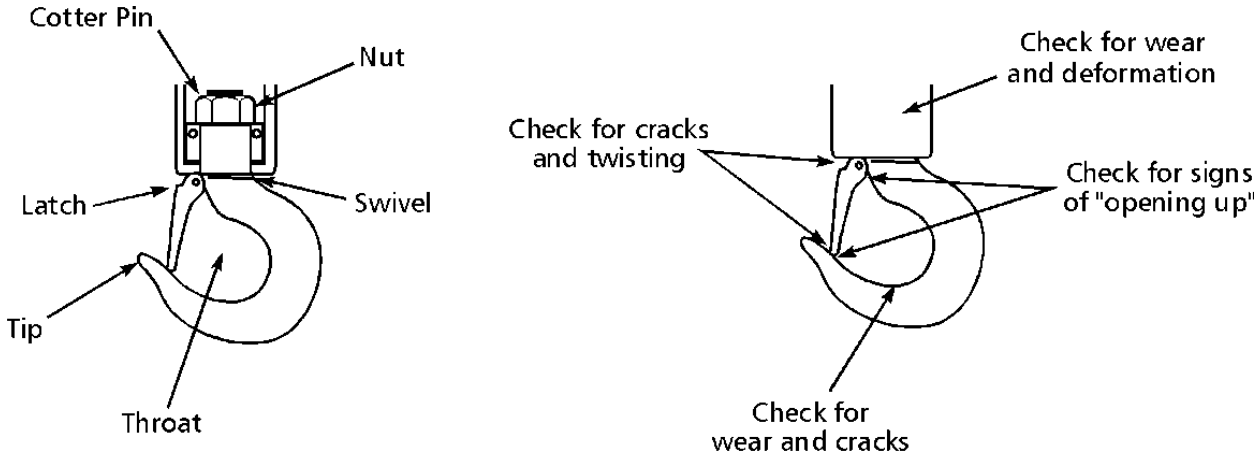


Figure 4- Hook Inspection

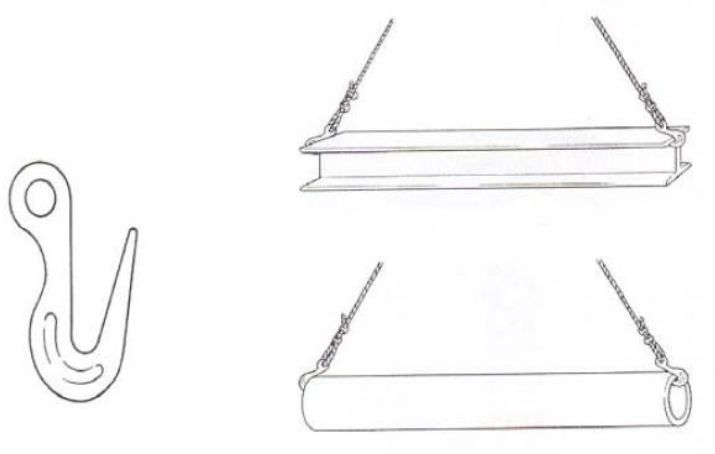


Figure 5- Pipe Hooks (Sorting Hooks)

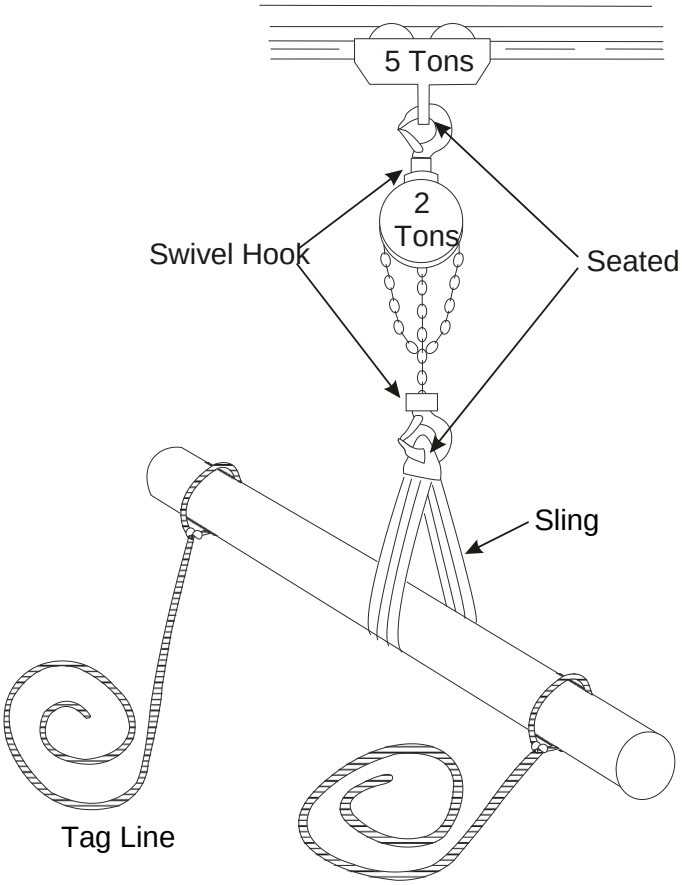


Figure 6- Safe Use of Hooks

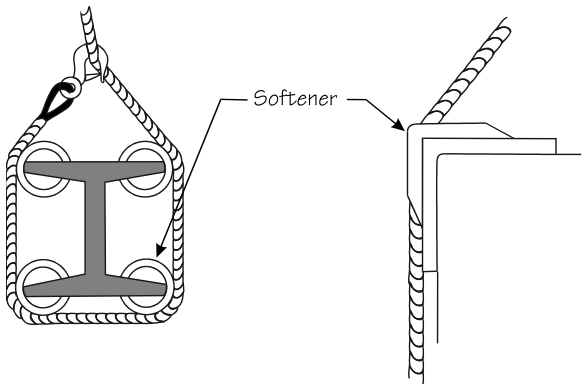
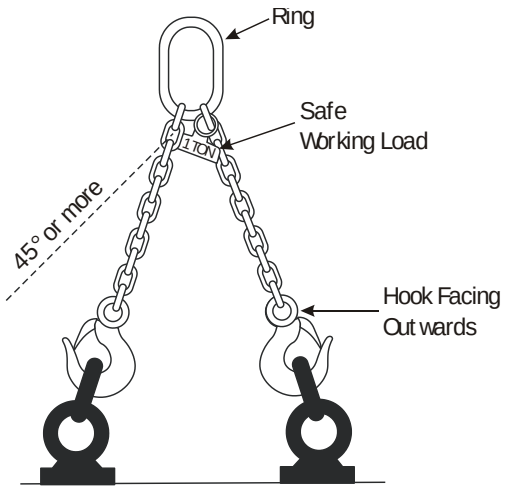


Figure 7- Sling Softeners



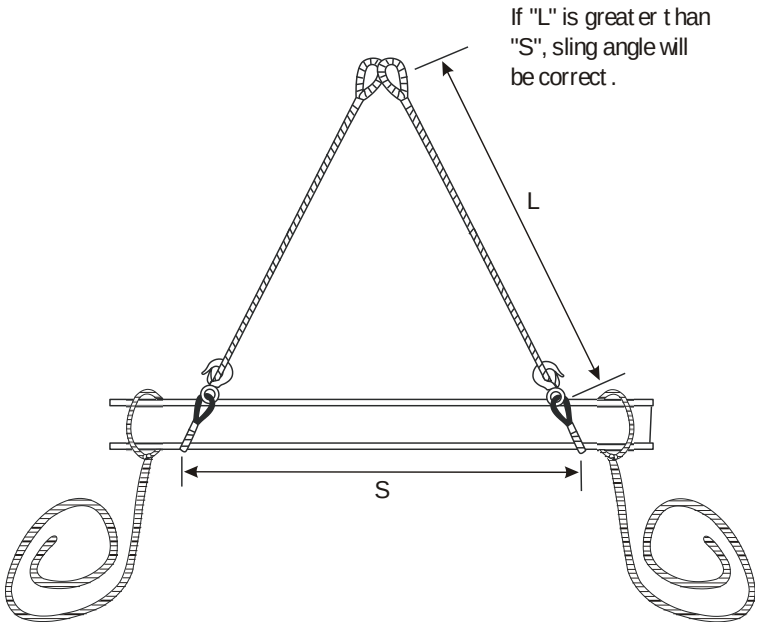


Figure 8- Sling Angles

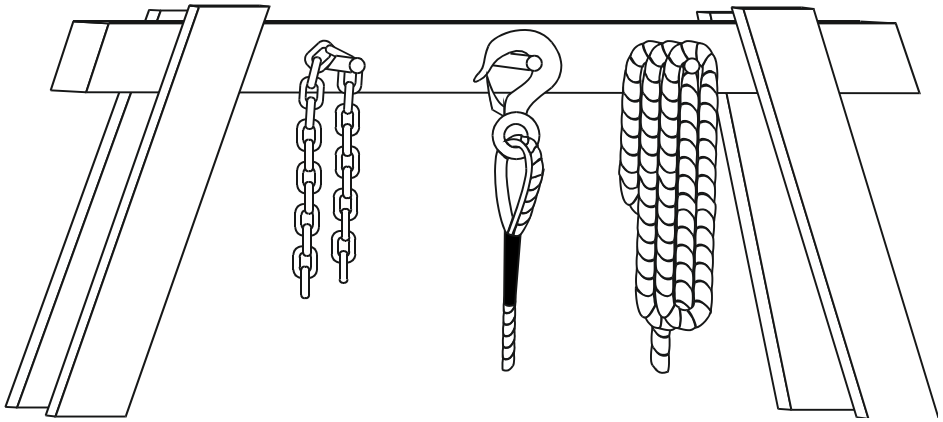


Figure 9- Sling Storage Rack

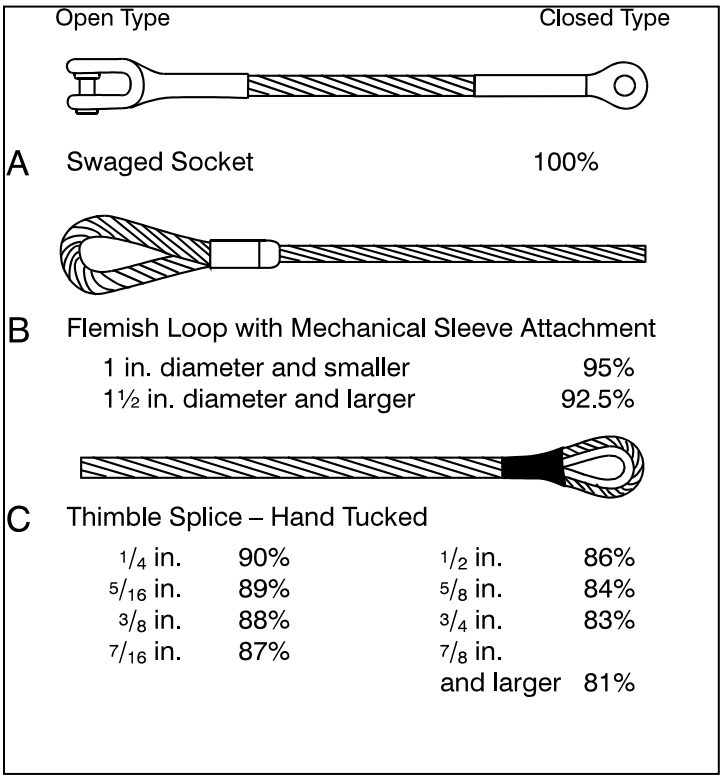


Figure 10- Attaching Rope to Fittings

Table 1- Safe Working Load for Wire Rope Slings

Rope Diameter (inches)	Single Leg (Tonnes)						Two-Leg Bridle or Basket Hitch (Tonnes)											
	Vertical			Choker			Vertical[1]			60 degrees			45 degrees			30 degrees		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
6 × 19 Classification Construction																		
⅜	1.3	1.2	1.1	0.98	0.93	0.86	2.6	2.5	2.3	2.3	2.1	2.0	1.8	1.8	1.6	1.3	1.2	1.1
½	2.3	2.2	2.0	1.70	1.60	1.50	4.6	4.4	3.9	4.0	3.8	3.4	3.2	3.1	2.8	2.3	2.2	2.0
⅝	3.6	3.4	3.0	2.70	2.50	2.20	7.2	6.8	6.0	6.2	5.9	5.2	5.1	4.8	4.2	3.6	3.4	3.0
¾	5.1	4.9	4.2	3.8	3.6	3.1	10.0	9.7	8.4	8.9	8.4	7.3	7.2	6.9	5.9	5.1	4.9	4.2
⅞	6.9	6.6	5.5	5.20	4.90	4.10	14.0	13.0	11.0	12.0	11.0	9.6	9.8	9.3	7.8	6.9	6.6	5.5
1	9.0	8.5	7.2	6.70	6.40	5.40	18.0	17.0	14.0	15.0	15.0	12.0	13.0	12.0	10.0	9.0	8.5	7.2
1⅛	11.0	10.0	9.0	8.50	7.80	6.80	23.0	21.0	18.0	19.0	18.0	16.0	16.0	15.0	13.0	11.0	10.0	9.0
6 × 37 Classification Construction																		
1¼	13.0	12.0	10.0	9.9	9.2	7.9	26.0	24.0	21.0	23.0	21.0	18.0	19.0	17.0	15.0	13.0	12.0	10.0
1¾	16.0	15.0	13.0	12.0	11.0	9.6	32.0	29.0	25.0	28.0	25.0	22.0	22.0	21.0	18.0	16.0	15.0	13.0
1½	19.0	17.0	15.0	14.0	13.0	11.0	38.0	35.0	30.0	33.0	30.0	26.0	27.0	25.0	21.0	19.0	17.0	15.0
1¾	26.0	24.0	20.0	19.0	18.0	15.0	51.0	47.0	41.0	44.0	41.0	35.0	36.0	33.0	29.0	26.0	24.0	20.0
2	33.0	30.0	26.0	25.0	23.0	20.0	66.0	61.0	53.0	57.0	53.0	46.0	47.0	43.0	37.0	33.0	30.0	26.0
2¼	41.0	38.0	33.0	31.0	29.0	25.0	83.0	76.0	66.0	72.0	66.0	57.0	58.0	54.0	47.0	41.0	38.0	33.0

NOTES

1. Softeners should be used if slings are used to handle loads with sharp corners. The radius of the bend should not be smaller than five times the diameter of the rope. If the radius is smaller, a choker hitch rating should be used.
2. Table is based on a safety factor of 5, sling angles formed by one leg and a horizontal line through the crane hook and uniform loading.
3. For 3-leg bridle slings, multiply safe load limits for 2-leg bridle slings by 1.5, and for 4-leg bridle slings, multiply by 2.0.
4. For fiber core slings having Type 1 or Type C attachments, multiply the above values by 0.93; for fiber core slings with Type B attachments, multiply the above values by 0.91.

20.0 Tools and Equipment Standard

20.1 Tool and Equipment Operation

Tools and equipment shall:

- be inspected prior to use, and be maintained in good operating condition
- be removed from service and tagged 'DO NOT OPERATE' when required (e.g., when defective)
- have proper guarded moving parts
- not be modified, and be used solely for their intended purpose

Open Bladed Knives

Open blade knives shall not be used unless a Hazard Assessment is completed to determine that alternate tools cannot be used to complete the task for which the open bladed knife is required. The Hazard Assessment shall review the scope of work, the cutting tool to be used and specific PPE (e.g., cut-resistant gloves or gauntlets).

When it is determined that an open bladed knife is the only tool that can be used to complete a task the following criteria shall be met:

- specific PPE shall be worn at all times when using an open bladed knives
- material being cut is secure
- approval is noted on any applicable SWP's
- a working space appropriate to the task allows the Worker to work with the open bladed knife in a safe manner without endangering themselves or others

Grinders and Buffers

Workers using hand-held grinders and buffers shall:

- not use the side of a wheel unless it is designed for side-grinding
- stand to the side when starting the grinder, out of the line of fire
- adopt a stance to one side of a steel wire wheel, where possible
- unplug the tool when changing wheels or guards
- not use the tool to shape wood

Workers shall also check air grinders for maximum speed by dismantling the wheel and using a speed counter. If the speed exceeds the maximum revolutions per minute (rpm), reset the governor.

Prior to use, the grinder or buffer shall be inspected to ensure:

- the wheel is free of cracks
- the wheel does not vibrate excessively
- the buffing wheel has no loose wires or excess wear
- the disc is the correct size and type for the grinder, and is approved for more revolutions per minute (rpm) than the grinder
- all components are properly secured and in place
- there is no dead man/locking switch (these are prohibited)

Fixed grinding wheels shall have tool rests that are a maximum of 3 mm (1/8 in.) from the face of the stone and project 6 mm (1/4 in.) on either side of the grindstone. The angular exposure of the grinding wheel periphery and sides for safety guards shall not exceed 90 degrees or one-fourth of the periphery.

20.2 **Electric Tools and Equipment**

Workers using electric tools shall:

- unplug the tool when attaching or removing bits, blades or other accessories
- use approved electrical equipment to power the tools
- immediately tag as defective and remove from service any electrical cords and plugs with mechanical damage, e. g., exposed wiring; cords with frayed or deteriorated insulation; bent or broken prong of a plug, etc.
- immediately repair or replace any electrical cords or plugs tagged as defective
- ensure portable electric equipment is grounded or double insulated
- ensure extension cords are approved three-wire type, with appropriate conductor insulation and an overall jacket not susceptible to damage at low temperatures
- ensure cords are not permanently secured to any structure
- ensure power cords are elevated where possible, to prevent tripping hazards or being damaged by vehicles/equipment
- ensure all tools and equipment are set to the “off” position prior to plugging them in
- use Ground Fault-Circuit Interrupter (GFCI) protection when using portable tools outdoors or when water, moisture or wet conditions are encountered

Use approved ground-fault circuit interrupters for all 120-volt, single-phase, 15- and 20-ampere receptacle outlets which are not a part of the permanent wiring of the building or structure. Receptacles on the ends of extension cords are not part of the permanent wiring and shall be protected by GFCIs whether or not the extension cord is plugged into permanent wiring.

If an extension cord is to be used, keep the cords connection out of any standing water, and use a heavy duty extension cord with components rated for use in wet locations. Only Qualified electricians may cut or splice power cords or extension cords.

In addition to the above, Workers shall also follow these requirements:

- Unattended temporary electrical equipment (such as lights, heaters, etc.) that will be left on in a Hazardous Area or Restricted Area shall be approved and installed for Class 1, Div. 2 area classifications.
- Metal measuring tapes, aluminum ladders, or ropes having metal threads woven into the fabric shall not be used near exposed, live electrical parts.
- Portable generators used on the worksite shall be grounded, in accordance with manufacturers’ specifications.
- All voltage and current testers shall be rated for the circuits and equipment to which they are connected.
- Safety ground cables used in electrical cubicles and substations shall be stored in a central location.

Safety ground cables shall be:

- an appropriate size for the location

- fitted with 400-amp clamps on each end, and suitable for connecting to switchgear or substation equipment, and to ground
- fitted with approved crimped ferrules (installed on wire ends to attach to clamps)
- kept as short as possible
- attached in a phase to phase to ground concept, where possible

Only Qualified Electrical Workers can:

- inspect or repair defective portable electrical equipment
- arrange temporary wiring for a power supply (e.g., where needed for portable electrical tools, equipment, and lighting units)

20.3 **Gas-Operated Equipment**

Hazardous energy shall be controlled prior to performing maintenance of gas-operated equipment such as chainsaws and brush cutters.

Workers using chainsaws shall:

- meet legislated training/certification requirements
- ensure that all operators are provided with a personal first aid kit, spill kit, fire extinguisher and an effective means of communication for summoning assistance
- wear required PPE, in accordance with the Hazard Assessment

20.4 **Air-Operated Tools and Equipment**

Workers using air-operated tools shall:

- set the air supply properly for the tool being used
- shut off the air supply and drain the air prior to disconnecting tools

Workers using impact wrenches shall:

- ensure the directional lever is in the correct position prior to loosening or tightening a bolt or nut
- if a locking mechanism is required, use a one-piece neoprene retaining ring when attaching a socket to a larger impact wrench

Steel locking pins with separate rubber O-rings may cause serious injury. If the O-ring becomes dislodged, it causes the steel locking pin to protrude during operation.

Workers using compressed air equipment shall wear PPE and ensure the working area is cleared of other Workers. In addition, compressed air equipment shall:

- include safety nozzles, plus effective chip guarding
- never be used for cleaning Workers or their clothing
- not exceed 30 psi when cleaning equipment or floors
- not be adjusted to allow the compressor to operate above the manufacturer’s specified rating

Pneumatic hoses shall:

- be appropriately rated for the maximum pressure produced in systems

- have excess flow valves or chokes installed on all airlines at the compressor or header, to prevent high-volume air release

All hoses exceeding ½-inch inside diameter shall have a safety device at the source of supply or a branch line to reduce pressure in case of hose failure.

In addition, pneumatic hoses shall have temporary and quick connections secured, using whip checks on the following connection points:

- compressor to hose
- hose to hose
- have safety pins where the connection point is designed for their use
- have safety clips or retainers used at the attachment point on pneumatic impact percussion tools
- be protected from tangles, unnecessary wear and damage

Contractors shall:

- ensure all operators are evaluated and Qualified to operate all equipment with brand/model specific attachments including quick connect couplers
- ensure and document that the installation of the hydraulic quick coupler itself is performed according to the manufacturer's specifications

20.5 Equipment and Machine Guarding

No equipment or machine shall be operated unless the guards and protection (e.g., protective devices) are installed operating in accordance with their intended purpose, and properly maintained. Provide a method of machine guarding to protect Workers from hazards created by point of operation, ingoing nip points, rotating parts, or other hazards.

Guards are important to protect Workers from direct contact with moving parts, flying chips and sparks and rotating parts.

Guards and protection shall:

- meet manufacturers' specifications and Applicable Legislation
- be in good working order and inspected regularly
- not be modified or removed
- be replaced if damaged
- be the correct size
- be secure, and tamper-proof
- prevent falling objects
- allow for safe maintenance and inspected
- create no new hazards or interference
- provide a method to protect Workers from hazards created by point of operation, ingoing nip points and rotating parts

20.6 Compressed Gas Cylinders

Follow these requirements in relation to compressed gas cylinders:

- connection points shall be free of debris before attaching cylinders, hoses, valves, regulators or other fittings
- cylinders shall be legibly marked, by stenciling, stamping or labeling with either the chemical or trade name of the gas; the markings shall not be easily removable

- cylinder valves shall be closed and have shipping caps in place when the cylinder is not in use
- when in use, the cylinder shall be secured with non-combustible materials or means
- when in use, cylinders shall have fixed hand wheels, unless they have keys, handles or non-adjustable wrenches on valve stems
- in multiple cylinder installations, there shall be only one key or handle for each manifold
- use only torch and regulator valves to control the flow of gas
- close cylinder valves when work is completed, and when cylinders are to be moved or are empty
- cylinders shall not be exposed to extremely high temperatures (above 52°C or 125°F)
- when in use, flammable gas and nitrogen cylinders shall not be brought into enclosures/hoardings, and shall be kept outside with a hose run into the enclosure/hoarding
- protective covers shall be on all compressed gas cylinders when not in use

Contact the supplier if any part of the cylinder or attachments is not working properly. Do not force valves or tamper with safety features on compressed gas cylinders.

When gas-welding, cutting equipment or torches are used, ensure that a flashback device is installed (as per manufacturers' specifications) and that a back-flow prevention device is installed at the torch end.

Gauges, regulators and fittings shall:

- be bled down upon completion of work
- have the valve closed and all pressure released prior to being removed
- be disconnected when the cylinder is not in use
- have the regulator pressure-adjusting screw fully released prior to attachment
- not be used with oil or grease as a lubricant on oxygen regulators as it may cause an explosion
- be marked "USE NO OIL" when used for oxygen service
- have broken gauge lenses replaced prior to use

When working with oxygen cylinders, follow these requirements:

- Do not use or place oil or grease on or near an oxygen cylinder, when under pressure.
- Never lubricate oxygen fittings.
- Ensure all wrenches used are oil/grease free.
- Ensure the valve is fully open when in use, to prevent oxygen leakage around the stem.

Compressed Gas Cylinder Storage

Storage practices for compressed gas cylinders shall be in accordance with Applicable Legislation including fire and building codes and the following requirements shall also be met:

- vented room with air exchange
- explosion proof lighting
- properly rated fire walls separating the storage space from other nearby spaces/areas
- storage room shall have at least one exterior wall along an outside wall in a space
- storage room shall be located away from machinery
- flammable gas shall be stored outdoors unless specific fire code requirements and manufacturers specifications are met

When stored, cylinders shall be:

- placed up-right (unless the cylinder contains a non-flammable gas which is designed to be stored on their side)
- away from sources of heat
- secured with non-combustible materials or means (preferably chained)
- located in a dry, well-protected, well ventilated location
- placed at least 6 m (20 ft.) from highly combustible materials or separated by a fire resistant barrier no shorter than 1.5 m (5 feet) with a 30 minute fire rating

Other requirements include:

- segregate flammable gasses and compressed oxygen, as per Applicable Legislation, including but not limited to WHMIS standards
- ensure “NO SMOKING” and other applicable signage is posted in the area
- ensure outdoor storage areas are at least 1.5 m (5 ft.) from building entrances, or as required by Applicable Legislation

Transport

During transport, compressed gas cylinders shall:

- be secured
- be secured upright, and as required by Applicable Legislation (e.g., for flammable gases)
- be transported in a well-ventilated vehicle
- have shipping caps in place
- be transported on hand trucks designed for the task
- not be dragged, rolled or slid

Nitrogen cylinders may be transported horizontally if properly secured.

Compressed gas cylinders being hoisted shall:

- be secured on a cradle, cage, sling board
- not be hoisted or transported by means of magnets or choker slings

Compressed gas cylinders mounted on portable welding units shall:

- have acetylene secured in the upright position
- have oxygen and nitrogen secured in either vertical or horizontal position
- have valves closed and protective caps in place when not in use
- have mounting arrangements that hold the cylinder securely in the event of a rollover or other traffic Incident

Aerosol Cans

Aerosol cans are widely used to apply paints, lubricants, insect repellent, or other contents. Some air horns are aerosol-activated.

When exposed to heat, aerosol containers can either violently rupture or produce burning jets of flame; in either case there is a risk of injury or property damage.

The most effective method of preventing aerosol-related Incidents is proper storage. Aerosols shall be stored under cover and protected from exposure to the weather and direct sunlight and kept at least 3 m (10 ft.) from any source of heat or ignition. Store aerosol cans at the correct temperature as recommended by the manufacturer.

Where aerosols are kept in distribution centers, they shall be stored within strong mesh enclosures (i.e., caged).

20.7 Propane Bottles and Accessories

When a propane bottle is in use, fully open the valve.

When not in use, fully close the valve.

Do not use the valve to regulate the flow of propane.

Store propane compressed gas cylinders as follows:

- outdoors on concrete or other non-combustible platforms
- in an area that provides protection from tampering
- in an area free of vehicle or mobile equipment travel; if propane cylinders are required to be temporarily stored in areas vehicle traffic is expected then they shall be protected by barriers
- away from a fire escape, stairs or building egress
- at least 7.5 m (23 ft.) away from buildings, unless in an approved storage cabinet; if using an approved storage cabinet, then store 1 m (3 ft.) away from buildings and 3 m (9ft.) away from air intakes
- at least 1 m (3 ft.) from other flammable compressed gas containers (e.g., acetylene)
- at least 6m (20 ft.) from containers or dispensers for flammable and combustible liquids (e.g., gasoline and diesel fuel), or cylinders of compressed oxygen

Propane fuelled, hand-held torches shall be used for their intended purpose which is to be hand-held and under constant supervision. These torches shall only be used for pre-heating of piping and other specific intended purposes prior to welding. They shall not be used for temporary heating and shall never be unattended.

20.8 Portable Heaters

All portable heaters shall:

- be properly grounded or bonded as required
- not be left unattended when in operation
- not be placed on or near combustible surfaces

- have combustible and flammable materials removed from the immediate area
- have a fire extinguisher when placed in Hazardous or Restricted Areas
- used only in accordance with the manufacturer's instructions

When using a portable heater in a Hazardous Area or Restricted Area, initial and continuous Atmospheric Monitoring shall be conducted by a Qualified Worker.

Portable fuel heaters shall be operated only where there is adequate ventilation. Adequate ventilation is necessary to prevent exhaust emissions from being drawn into the heater and into the space being heated. For enclosed or Confined Spaces the heater and fuel shall be located outside of the space, away from openings. Monitor for atmospheric hazards when heated air is being introduced to enclosed spaces occupied by Workers.

Portable Catalytic Heaters
Portable catalytic heaters shall:

- require continuous monitoring when used in an explosive or hazardous atmosphere
- be approved for use in an explosive or hazardous atmosphere; approval shall be from an applicable, recognized authority, such as the Canadian Gas Association (CAN) or American Gas Association (USA)
- have adequate ventilation to prevent a build-up of exhaust fumes and prevent the fumes from being drawn through the heater and into the space being heated
- have carbon monoxide monitors when required
- have only explosion-proof electrical fittings attached
- have a regulator between the propane bottle and the heater to reduce the pressure of gas to the heater, to a level specified by the manufacturer
- have a thermostatic block valve installed on the propane line where it enters the heater; this serves as an automatic, positive shutoff on the line when the heater is not in use, preventing gas from escaping through the heater to the atmosphere
- not be used in electrical enclosures where there are open relays, as the vapors leave an insulating residue on open contacts that is difficult to remove
- be used only in accordance with manufacturer's instructions

No portable heating devices are permitted for use by Workers in Enbridge administrative offices in Edmonton, Calgary, Duluth, Superior and Edina. Please refer to Enbridge's Portable Heating Device Policy. The policy can be found on ELink under Policies & Procedures.

Acronyms

ACGIH	American Conference of Governmental Hygienists
ACM	Asbestos Containing Material
AFFF	Aqueous Film-Forming Foam Concentrate
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
API	American Petroleum Institute
APR	Air-Purifying Respirator
ATPV	Arc Thermal Protection Value
CCO	Control Center Operations
CDC	Center for Disease Control and Prevention, United States
CFR	Code of Federal Regulations
CMV	Commercial Motor Vehicle
CSA	Canadian Standards Association
DOT	Department of Transportation
ENB (NW)	Enbridge North West Region
FLHA	Field Level Hazard Assessment
GDL	Governance Documents Library
GDP	Ground Disturbance Package
GHS	Global Harmonization System
HAZCOM	Hazard Communication
HAZMAT	Hazardous Materials Transportation
HAZOPS	Hazard and Operability Studies
HEPA	High Efficiency Particulate Air
HPWJ	High-Pressure Water Jetting
HRC	Hazard Risk Category
HVSA	High Visibility Safety Apparel
HRSDC	Human Resources and Skills Development Canada
IDLH	Immediately Dangerous to Life or Health Concentrations
ICS	Incident Command System

IMS	Integrated Management System
LEL	Lower Explosive Limit
LOA	Lockout Authority
LOPA	Layers of Protection Analysis
LOTO	Lockout/Tagout
LP	Liquids Pipeline
MOC	Management of Change
MP	Major Products
MSDS	Material Safety Data Sheet
MVI	Motor Vehicle Incident
NEB	National Energy Board
NFPA	National Fire Protection Association
NGL	Natural Gas Liquids
NIOSH	National Institute of Occupational Safety and Health
OEL	Occupational Exposure Limit
OHSMS IMS-04	Occupational Health and Safety Management System – Integrated Management System -04
OMM	Operating and Maintenance Manuals
OPIM	Other Potentially Infectious Material
OSHA	Occupational Health and Safety Administration
PAPR	Powered Air-Purifying Respirator
PACM	Presumed Asbestos Containing Material
PCB	Polychlorinated Biphenyls
PEL	Permissible Exposure Limit
PHA	Process Hazard Analysis
PPE	Personal Protective Equipment
RPE	Respiratory Protective Equipment
ROPS	Roll Over Protection Structures
ROW	Right-of-Way
RSO	Radiation Safety Officer
SAR	Supplied-Air Respirator
SCBA	Self-Contained Breathing Apparatus

SDS	Safety Data Sheet
STEL	Short Term Exposure Limit
SWP	Safe Work Permit
SWL	Safe Working Load
TDG	Transportation of Dangerous Goods
TLV	Threshold Limit Value (ACGIH)
TSA	Task Safety Analysis
TWA	Time Weighted Average
WHMIS	Workplace Hazardous Material Information System
WMP	Waste Management Plan

Defined Terms

Affected Worker(s)	Workers whose job requires them to operate or use machine or equipment on which maintenance is being performed under lockout/tagout, or requires them to work in an area where maintenance is being performed.
Air-Purifying Respirator (APR)	CSA Z94.4-11 and OSHA 1910.134 A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.
Ambient Air System	An ambient air system is an air-moving device (i.e. ambient air blowers/pumps in permanent and moveable configurations but excludes compressors) which draws air directly from the outdoors and designed by its manufacturer not to exceed an operating pressure of 103.4 kPa (15 psig).
Applicable Legislation	All federal, provincial, state and municipal laws, regulations, codes, by-laws, ordinances or otherwise that are applicable to the jurisdiction in which the work is conducted including, but not limited to the Canada Labour Code, OSHA, State OSHA, Provincial and Territorial OH&S
Appurtenances	All attachments to piping (e.g., valves, plugs, fittings, stopple fittings, welded fittings, flanges, vents, branch piping, known abandoned Below Grade Facilities, etc.)
Atmospheric Monitoring	Atmospheric Monitoring that continuously monitors atmospheric content and results are typically determined in real-time (e.g. use of a handheld instrument).
Atmospheric Sampling	An atmospheric test that details atmospheric content at a point in time and results are typically determined by an analytical laboratory.
Aqueous Film-Forming Foam Concentrate (AFFF)	A substance that is based on fluorinated foam surfactants plus foam stabilizers and usually diluted with water to a 3% or 6% foam solution. The foam solution acts as a barrier that excludes air or oxygen and develops an aqueous film on the fuel surface capable of suppressing the evolution of fuel vapors. The foam solution is suitable for combined use with dry chemicals.
Area Monitoring	The use of portable gas monitors and grab sampling equipment for determining if a hazardous atmosphere is present at the work site.
As Low As Reasonably	The point at which the cost and resources required

Achievable (ALARA)	to reduce risk any further is disproportionate to the benefit gained.
Authorities Having Jurisdiction	Any duly constituted Federal, State/Provincial, Municipal, Board or other Public Authority having jurisdiction over the matter.
Authorized Installer	When referring to radiation, an individual who has received 8 hours of training specific to gauge installation and who is listed on the nuclear materials license.
Authorized User	When referring to radiation, an individual who has received the initial nuclear densitometer radiation safety training according to the nuclear materials license.
Authorized Worker	Qualified and authorized personnel who perform lockout/tagout of a machine/equipment in order to perform maintenance on that machine/equipment.
Below Grade Facility	Refers to existing below grade operating facilities, utilities, structures and supports; such as pipelines, cables, conduits, casings, concrete piles, or concrete foundations.
Below Grade Facility Contact	Any puncture, crack, scratch, gouge, flattening, or dent of the surface of a Below Grade Facility OR damage to the protective coating of the Below Grade Facility.
Benching (Benching System)	A method of protecting Workers from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near vertical surfaces between levels.
Blue Flag	Blue signals displayed in accordance with the Code of Federal Regulations signify that workers are on, under, or between rolling equipment and that equipment shall not be moved or coupled into.
Blood	Includes human blood, human blood components, and products made from human blood.
Bloodborne Pathogen	Pathogenic microorganism present in human blood that can cause disease in humans. These pathogens include, but are not limited to, Hepatitis B Virus (HBV) and the Human Immunodeficiency Virus (HIV), which causes the disease known as Acquired Immune Deficiency Syndrome (AIDS). These pathogens can be transmitted by injection (needle stick/sharp tools) or contact with blood, vomit or other body fluids; also through contact with

	mucus membrane, eyes or non-intact skin.
Bonding	The process of connecting two or more conductive objects together by means of a conductor.
Borehole	A hole in the ground created by drilling, auguring, boring, or other similar operation.
Breathing Zone	Volume surrounding a Worker's nose and mouth from which they breathe air over the course of a work period. This zone can be pictured by inscribing a sphere with a radius about 25 cm (10 in.) centered at the Worker's nose.
Brown Field	Any construction site or activities inside or adjacent, within 3 m (10 ft.), to existing Enbridge facilities. If Hot Work is performed in a Hazardous or Restricted Area, it is considered Brown Field, e.g. construction work inside a facility or beside an exposed operating pipeline that does not have an identified boundary.
CO_2 System	A type of fixed fire extinguishing system that releases carbon dioxide from cylinders into an enclosed space. Operation is triggered automatically or manually.
Cave-In	The separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.
Ceiling (C) Exposure Limit	An Exposure Limit which should not be exceeded at any time.
Cold Work	Any work activity or process that is unlikely to ignite flammable vapors (e.g., does not involve a spark, an open flame or a hot surface).
Competency	The ability for an individual to demonstrate of both the knowledge and practical skills and training to consistently perform a given task to a pre-determined standard.
Conductor	Cable, bus or any conductive piece of electrical equipment.
Confined Space	An enclosed or partially enclosed area that meets all of the following: • is not designed or intended for continuous Worker occupancy (e.g., tanks, pipes), • has restricted means of entry and exit that may compromise the provision of first aid, evacuation, rescue, or other emergency

	response (e.g., manholes, electrical vaults, boreholes, pits, sump tanks, vertical and horizontal culverts), and • is large enough so that a Worker's entire body can enter the space
Confined Space Entry	Occurs when any part of a Worker's body enters into a Confined Space.
Contractor	A legal entity with whom Enbridge may enter into an agreement for the provision of labor, materials and/or equipment by the Contractor in the delivery of a specified scope. Note: This is not an Enbridge Contractor.
Contractor Personnel	Employees of a Contractor or Subcontractor working under the direct supervision of the Contractor.
Control	A mechanism or process that minimizes the risk of the hazard becoming actual so it protects people, property or the environment from the identified hazard.
Control Area	Is an area designated by the site Inspector or crews doing the work that has been isolated through the use of barriers, tape etc. to restrict access in order to manage specific hazards as identified in the Task Specific Hazard Assessment.
Critical Task	A task which has the potential to produce major loss to people, property, process and/or the environment when not performed properly. Liquids Pipelines Operations tasks that have been rated as greater or equal to 7 using the task evaluation process are considered critical.
Cylinder	High pressure container used for compressed gas storage.
De-energized	Disconnected or otherwise isolated from all energy sources and not containing residual or stored energy.
Destructive Below Grade Activity	Any activity such as mechanical excavation, drilling, boring, piling, deep tilling, and grading.
Employee	Individuals filling full or part-time positions that have been established for an undefined period of continuous employment. Individuals filling temporary or casual full time or part time positions that are established for a limited, predetermined period of time, usually less than one year in length.

Enbridge	A generic term used for Enbridge Liquids Pipelines, Major Projects, and other legal entities under the control of Liquids Pipelines.
Enbridge Contractor	A named individual who is not an Employee and who provides specific services for a specified time under a contract with Enbridge. The individual may contract directly with Enbridge or may be covered under any and all schedules in any and all contracts with Enbridge Inc. This individual may require internal network access and/or building access. For a complete definition refer to the Human Resources Employment Policies and Procedures for Contractors located on elink.
Enbridge Employee	Enbridge Employee refers to both Employee's and Enbridge Contractor's.
Enbridge Inc.	The parent Enbridge corporation and each of its wholly-owned subsidiaries and affiliates.
Enbridge Locations	All Enbridge sites, workplaces, worksites, facilities, terminals, stations and administrative and project offices.
Enbridge Operating Asset	An Enbridge-owned asset that has been commissioned.
Enbridge Operations Representative	A generic term that refers to the Enbridge Employee responsible for the location (e.g. site supervisor, PLM coordinator/supervisor, technician, terminal supervisor) or designate.
Enbridge Representative	Employee or third party hire representing Enbridge for specific Contractor work or project.
Enbridge Site Inspector	An Enbridge employee or any third party hire overseeing Enbridge projects on behalf of Enbridge and who is responsible for the inspection of work. May include trade specific inspectors.
Enbridge Workforce	See Workforce.
Enclosed Space	Enclosed or partly enclosed area that is not designed nor intended for frequent and lengthy occupancy, has unrestricted means of entry and exit (e.g. pump shelters and densitometer, instrument and sample buildings), and that may aggravate ordinary job hazards.
Energized	Connected to an energy source or contains residual or stored energy.
Energized Equipment	Conductors and conductive parts of electrical equipment that are not locked out and verified energy free. High-voltage equipment is considered energized until grounded.

Energy Isolation Device	Mechanical device that physically prevents the transmission or release of energy.
Energy Source	Any origin of electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other force.
Ergonomics	Scientific study of people and the work they perform with the goal of minimizing risk of injury/illness through improved workstation design; reducing non-value added motions and improving Worker moral, productivity and product quality.
Excavation	Any man-made cut, cavity, trench or depression in an earth surface, formed by earth removal.
Excavation Area	The area in which any type of excavation is expected to occur. The perimeter of the Excavation Area is to be demarcated with pink and white striped flagging.
Excavator/Ground Disturber	Entity in charge of the Ground Disturbance
Exposure Limit	Workplace standard below which is believed that nearly all normal and healthy Workers may be repeatedly exposed, day after day, for working lifetime without adverse health effects.
Extinguishing Agent	A substance (e.g., dry chemical powder, foam) that interrupts the chemical chain reaction that produces fire by removing heat, removing fuel and/or removing or diluting oxygen (i.e., a substance that can put out a fire).
Facility	Any above or below grade appurtenances (e.g., Pipelines, piping, valves, communication or electrical equipment, conduits, power lines, guide wires, poles, towers, casings, piles, foundations etc) or the site on which such appurtenances are located (e.g., Pump / Compressor stations, valve sites, pipeline right of way), as the context may require
Fall Protection	Protection devices used at elevations that would allow a fall of a short distance (uses an anchorage point).
Fatigue	Weariness or exhaustion due to extended periods of physical and/or mental exertion or illness.
Field Level Hazard Assessment (FLHA)	A tool used just prior to the start of work to identify, assess and control the field-based hazards of the work being performed, and site or environmental conditions that may adversely affect the work (e.g. icy conditions, simultaneous operations,

	pedestrians).
Fixed (extinguishing) System	Self-contained fire suppression system that includes piping, extinguishing agents (e.g. halon, CO_2, foam, water) and discharge components (e.g. nozzles, sprinklers).
Flame Resistant Garments	Clothing made from material with flame resistance properties, i.e. combustion of the clothing is prevented, terminated or inhibited (slowed). Also known as FR Garments
Foam System	Equipment and piping that distributes Fluoroprotein (FP) foam to suppress tank fires. A semi-fixed system uses a mobile foam unit that is moved to the fire location and temporarily connected to fixed piping laterals. With a fixed system, the foam unit is housed in a building and permanently connected to lateral piping.
Foam Trailer	A mobile proportioning unit that connects to a fire hydrant.
Gas	A compressible, formless material that will completely occupy an enclosure irrespective to its quantity. It is a physical state that be changed to a solid or liquid state only by increasing pressure or reducing temperature, or both (e.g., H_2S).
Green Field	Areas within the confines of project boundaries that contain no above or below ground facilities.
Ground	A conductor that provides an electrical path for the flow of current into the earth.
Ground Disturbance	Any work, operation or activity that results in penetration of the earth (e.g., excavating, digging, trenching, plowing, tunneling, auguring, boring, drilling, backfilling, blasting, cultivation, topsoil stripping/leveling, stumping, peat removal, quarrying, fencing, clearing/grading, hydrovac) with the following exceptions: • survey staking line locating and marking • disturbance less than 30 cm (12 in.) in depth provided the location and depth of cover for all facilities is known.
Ground Disturbance Inspector/Competent Person	Individual overseeing and/or supervising Ground Disturbance activities.
Ground Disturbance Package (GDP)	All Ground Disturbance related documentation including Ground Disturbance Permit, Excavation Checklist, site plot plan, alignment sheets, as-builts, route sheets, station piping and instrument drawings (P&ID's).
Group Lockout	Lockout involving 2 or more Workers.

Halon System	Fixed extinguishing system that releases halon from cylinders into an enclosed space. Operation is triggered automatically or manually.
Hand Expose	To remove the soil surrounding a pipeline in a manner that does not have the potential to damage the pipeline or its coating.
Hand Exposing	See Hand Expose.
Hand Exposure	See Hand Expose.
Hazard	Source or situation with a potential for harm in terms of injury, ill health, damage to property, damage to workplace and environment, or any other definitions as set out by regulations and codes.
Hazard Assessment	Methodology used to identify, assess and control hazards in order to eliminate or reduce risk to an acceptable level. Includes FLHA, Process Hazard Assessment (or Analysis), HAZOPS, Job Safety Analysis, Facility Hazard Assessments, etc.
Hazard and Operability Studies (HAZOPS)	An Enbridge accepted Process Hazard Assessment (PHA) Review methodology.
Hazard Risk Category (HRC)	Categories defined by NFPA 70E-2012 and CSA Z462-12 to explain protection levels needed when performing tasks on energized electrical equipment. The values range from 1 to 4.
Hazardous Area	An area in which there is significant potential for a flammable or toxic atmosphere to be present or develop.
Hazardous Atmosphere	An atmosphere which exposes an individual to a risk of injury, illness, disablement, or death due to one or more of the following causes: • A flammable gas/vapor concentration in excess of 10% of its lower explosive limit (LEL) • An atmospheric oxygen concentration below 19.5% or above 23%. • An atmospheric concentration of any substance above the exposure limits established by the governing regulatory body or as indicated on the Material Safety Data Sheet (MSDS/SDS) • Any atmosphere which is recognized as Immediately Dangerous to Life and Health (IDLH).

Hazardous Energy	Any electrical, mechanical, hydraulic, pneumatic, chemical, nuclear or kinetic energy source that if released uncontrolled, could cause injury or loss.
Hazardous Material	A material, other than hazardous waste, that because of its quantity, concentration and physical or chemical characteristics, either individually or in combination with other substances is or poses a threat to the environment, humans or other living organisms.
Hazardous Waste	A substance or material which is no longer used for its original purpose and requires disposal, and by reason of its properties is considered a potential or existing hazard to human health or the environment and therefore, requires special management. The specific classification of a hazardous waste in Canada varies by province/territory.
Heavy Service	Service that involves operation of lifting equipment within the safe working load that exceeds normal service.
Hierarchy of Controls	A system used to implement controls based on the level of effectiveness to minimize or eliminate exposure to hazards. Elimination of the hazard or risk is the most effective form of control. 1. Elimination 2. Substitution 3. Engineering 4. Work Practice 5. Administrative 6. Personal Protective Equipment
High Efficiency Particulate Air (HEPA) Filter	A filter that is at least 99.97% efficient in removing mono-disperse particles of 0.3 micrometers in diameter. Including filters used for personal respiratory protection, vacuum cleaners, or heating/ventilation/air-conditioning systems.
High Voltage	Over 750 volts [CAN] or 600 volts [USA].
Hot Work	Any process that can be a source of ignition when flammable material is present or can be a fire hazard regardless of the presence of flammable material.
Hydrovac	See Vacuum Excavation
Immediately Dangerous to Life or Health Concentrations (IDLH)	An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere

	with an individual's ability to escape from a dangerous/hazardous atmosphere.
Initial Locate	An initial locate is done to determine the location of Below Grade Facilities by One-Call members (owner/ operators) inside of the area defined by the One-Call ticket, or the Locate Boundary Area as prescribed by the Ground Disturbance Standard. The Initial Locate satisfies local legislative requirements (Local Regulations).
Incident	An unplanned activity or situation that resulted in or had the potential to result in, an adverse or undesirable environmental, health, safety, or business consequence.
Isolated	Sources of energy have been disconnected or controlled.
Isolation	Pre-defined system for securing one or more isolation points.
Isolation Point	Location where the energy isolation device is installed.
Layers of Protection Analysis (LOPA)	A Enbridge accepted Process Hazard Assessment (PHA) Review methodology.
Lifting Device	Supplementary device used to handle certain types of loads (i.e., hook, sling, clevis). The weight of lifting devices is considered part of the rated load.
Load	Total weight of an object plus the weight of the rigging equipment.
Locate Boundary Area	Area in which all Below Grade Facilities shall be Surface Located within the excavation perimeter and extending 30 m (100 ft.) from that perimeter. Constraints may be made on this perimeter and the lessened area shall be marked by multiple white markers identifying all of the corners of the Locate Boundary Area.
Lock	Lockout device used to secure an isolation device in the appropriate position to prevent accidental energizing or startup of the machine/equipment.
Lockbox	Container that securely stores the lock keys and unused locks of a lockset used for isolation to ensure they are secure until the machine/equipment is ready for de-isolation.
Lockout	Physical placement of a lock on an energy-isolating device to ensure the equipment being controlled

	cannot be energized until the lock is removed.
Lockout Authority (LOA)	Authorized Worker responsible for the lockout/tagout who implements and coordinates the overall lockout of hazardous energy sources for machines/equipment to be maintained. (For group lockout, one LOA shall be designated)
Lockout Device	Device that uses a positive means (i.e., key or combination type lock) to hold an energy-isolating device in the safe position in order to prevent the energizing of a machine or equipment. (This includes blank flanges and bolted slip flanges)
Long Term Operations Contractor Personnel	Enbridge Contractors who are embedded in the operations Workforce.
Low Voltage	30 to 750 volts (CAN) or 30 to 600 volts (US).
Lower Explosive Limit (LEL)	The lowest concentration (percentage) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat). At a concentration in air below the LEL there is not enough fuel to continue an explosion. Concentrations lower than the LEL are "too lean" to explode but may still burn with great heat and light. Exact values can be found on product's MSDS (SDS).
Management of Change (MOC)	A systematic approach to ensuring proposed changes are rigorously assessed for risk and impact, and that change is effectively managed prior to implementation to achieve targeted results
Master Lockbox	Primary lockbox where isolation point keys are located when using satellite lockbox system.
Material Lifting Structure	Structure used to support a material lifting hoist and its load (e.g., gantry).
Material Lifting Equipment	Apparatus used to lift, support or position material or equipment.
Mechanical Excavation	Using mechanized equipment to excavate.
Modified Work	Any work related injury or illness that prevents a Worker's ability to perform their regularly assigned duties, but are medically able to perform alternate, modified or restricted work.
Near Miss	Any event, which under slightly different circumstances, may have resulted in injury or ill health of people, or damage or loss to property, plant, materials or the environment.
Non-permit Required Confined Space	A Confined Space that has been checked, inspected and its atmosphere has been monitored and is being continuously monitored to ensure it

	does not have (or does not have the potential to have) any of the characteristics required to be classified as a permit required Confined Space.
Normal Service	Involves operation of lifting equipment with randomly distributed load within the rated load limit or uniform load of less than (<) 65% or rated load limit for no more than 25% of the time for a normal work shift.
One-Call (First Call)	A One-Call is a notice given to a local One-Call Centre/authority that an excavation will be taking place. Legislation varies by location, but anyone performing an excavation is typically legally obligated to contact the One-Call Centre/authority 2-5 days prior to commencing excavation. The One-Call Centre/authority notifies its members (owner/operators) that their Below Grade Facilities are in the vicinity of the excavation.
One-Call Member	A Facility Owner/ operator who subscribes to the One-Call Centre/authority, and is notified when a One-Call is placed if the excavation area is in the vicinity of the members Below Grade Facilities.
Open Blade Knife	Cutting tool with an exposed blade, hand held or otherwise, with or without a handle. It does not include hand held saws, grinders or other power tools that may be used for cutting purposes.
Open System	Any part of the pipeline system open to the atmosphere that has been isolated.
Open Water	Water that is unprotected and exposed such as rivers, lakes and ponds.
Overseeing	To watch over, observe and manage Enbridge requirements of the Contractor.
Operations Employee	Generic term used to refer to all Operations employees, including technicians.
Operations Management	Regional managers, team leaders, and their designates.
Other Potentially Infectious Material (OPIM)	Includes the following human fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, amniotic fluid, saliva in dental procedures, and any other body fluid that is visibly contaminated with blood; all body fluids in situations where it is difficult or impossible to differentiate between body fluids; any unfixed tissue or organ (other than intact skin) from a human (living or dead); cell or tissue cultures

	containing HIV; organ cultures, culture medium or other solutions containing HIV or HBV; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.
Partition	A portable safety screen complete with stand-alone lightweight frame that is used to enclose Hot Work activities (available in singular or multi-panel arrangement of various widths and heights).
Permissible Exposure Limit (PEL)	An occupational health standard instituted to safeguard Workers against exposure to toxic material in the workplace
Permit Required Confined Space	A Confined Space that is hazardous or that may become hazardous due to one or more of the following: • work activity would cause adverse health effects (e.g., fiber glassing, abrasive blasting, welding), • contains or has the potential to contain a hazardous atmosphere (e.g., H_2S, LEL or O_2), • contains a material that has the potential for drowning or suffocating a Worker (e.g., liquid), • has an internal configuration such that a Worker could become trapped or asphyxiated, and/or contains any other safety or health hazard which is recognized as immediately dangerous to life and health (IDLH) (e.g., energy sources, visibility).
People Leader	Anyone who has direct report(s).
Positive Identification	See Positively Identify.
Positively Identify	To visually locate (daylight) the location, depth and size of Below Grade Facility by using either water washing (hydrovac, as an example) or hand digging. This includes elevation or alignment changes that can alter the depth/direction of the pipe (i.e. 90 and 45 degree elbows), fittings, plugs, weldolets, flanges, branch piping, known abandoned facilities, etc.
Powered Air-Purifying Respirator (PAPR)	A type of respiratory protection that uses a blower to pass contaminated air through an element that removes the contaminants and supplies the purified air to a respirator inlet covering.
Powered Mobile Equipment	A self-propelled machine or combination of machines, including a prime mover or a motor vehicle, designed to manipulate or move material.
Process Hazard Analysis	A detailed examination of a process, equipment or facility design that will assist in identifying hazards

(PHA)	and required controls. PHA's are used to evaluate hazards in new designs as well as existing facilities.
Qualified	Verification of proficiency of learner by observation and participation on the job site and through an on-the-job assessment of competency by a supervisor or internal assessor.
Qualified Electrical Worker	A Worker who has the knowledge, training and experience to perform electrical work, including Enbridge electricians, contract journeymen electricians, and contractor electricians working under the direct supervision of contract journeymen electricians.
Qualified Safety Representative	An employee or Enbridge Representative acting as the designated safety resource in place of the applicable Safety Coordinator for pre-job planning and execution of pipeline repair jobs. Qualified safety representatives shall complete the Enbridge Inspector Qualification Training Program.
Radiation	Emission of atomic particles or electromagnetic energy from the nucleus of an atom. This emission is caused by the natural decay of radioisotopes (nuclides) and/or x-rays produced by electrical means from portable or fixed static equipment.
Radiation Safety Officer (RSO)	Designated individual who has received specific radiation safety training and who oversees the operations of the radiation safety program.
Radiation Source	Apparatus or material emitting or capable of emitting ionizing radiation.
Radiation Survey	Evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal or presence of radioactive material or other radiation sources. The evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities or radioactive material present.
Regulation	A rule, ordinance, law, legal standard or device by which conduct or performance is controlled.
Remote Field Locations	Includes valve sites, remote maintenance bases, rights-of-way, winter roads, highways and pipeline access. Terminals, pump stations, injection sites and operating and maintenance facilities are not considered remote field locations.

Residual Risk	Level of risk that remains after Risk mitigation actions are implemented.
Restricted Area	Any area in which there is limited potential for a flammable or toxic atmosphere to develop.
Risk	The combination of the likelihood and consequence of an unexpected positive or negative deviation from the expected outcome.
Roll Over Protection Structures (ROPS)	Engineered protection structures on heavy equipment and all-terrain vehicles meant to protect the operator and passenger(s) in the event the equipment rolls over.
Root Cause	Include personal factors and job factors from which substandard acts and conditions originate. These factors are the reasons why the immediate/direct causes exist and the identification of such factors permits meaningful management control. Root Causes are often also referred to as basic causes or indirect causes.
Safe Work Permit (SWP)	An agreement between the Permit Issuer and Receiver that is used to authorize work for a specific time and location and to ensure a safe area of work for the working group.
Safe Working Load (SWL)	Commonly understood to be the load which a given lifting device or lifting arrangement can safely lift, suspend or lower
Safety Data Sheet (SDS)	A Safety Data Sheet (SDS), previously called a Material Safety Data Sheet (MSDS), is a document that provides information on the properties of hazardous chemicals and how they affect health and safety in the workplace.
Safety Watch	A qualified Worker responsible for monitoring work activities to ensure safe work practices are followed, to identify hazards, to alert Workers of hazardous conditions and to initiate emergency response procedures.
Satellite Lockbox	Secondary lockbox used for complex group control (i.e., isolation over distance), multiple work groups and work with contractors.
Self-Contained Breathing Apparatus (SCBA)	A respirator that has a portable supply of breathing air and is independent of the ambient atmosphere. The breathing air source is designed to be carried by the user.
Shall	Indicates mandatory; no variance is permitted without authorization from the appropriate vice-president

Shoring	Shoring is a temporary installation, which “shores” up or supports trench or excavation walls to prevent movement of soil, underground utilities, roadways, and foundations.
Short Term Exposure Limit (STEL)	A 15-minute Time Weighted Average (TWA) exposure limit that should not be exceeded at any time during a workday even if the overall 8-hour TWA is within limits, and it should not occur more than 4 times per day. There should be at least 1 hour between successive exposures.
Should	Used where an action is recommended.
Signaler/Spotter	A competent Worker that looks for, locates, guides, signals, and reports hazards – as well as one who will stop unsafe activities – in relation to movement of vehicles and heavy equipment. This person shall have the ability to clearly communicate to the Workers under their care and site supervision as required.
Site	See Worksite.
Site Safety Plot Plan	Site-specific drawing that shows hazardous and restricted areas, primary evacuation site, secondary evacuation site, helicopter landing areas and the location of safety facilities and equipment (e.g., evacuation alarms, wind socks, fire extinguishers and first aid stations).
Site Supervisor	See Enbridge Operations Representative.
Sloping	A method of preventing cave-ins of excavation and trench walls by cutting them back on an incline away from the excavation or trench. The angle of incline shall vary with differences in such factors as the soil type, environmental conditions of exposure, and application of soil overloads.
Softener	Material used to prevent loads from slipping and to protect cable or rope from damage.
Spoil Pile	A pile of material that was removed from an excavation, trench, or borehole.
Standard	Approved Enbridge practice.
Standard Precaution	Administrative controls based on the premise that all blood and bodily fluids are considered infectious and are treated as such (also known as universal precautions).
Static Electricity	An accumulation of electric charge on an insulated body.

Stored Pressure Extinguisher	Extinguisher with both the extinguishing material and expellant gas kept in a single container.
Station/Terminal Site	Fenced-in pump stations, valve stations, terminals, etc.
Subcontractor	Any person, firm or corporation contracting with the Contractor to perform part of the work, and shall include partners and associates in a joint venture so contracting with the Contractor.
Supplied-Air Respirator (SAR)	An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.
Surface Located	All Below Grade Facilities have been located and surface marked.
Supplier	A generic term referring to Contractor(s) and Vendor(s) cumulatively.
Swingstage	Two-point adjustable suspension scaffold
Tagout	Placement of a perforated tag on an energy-isolating device to indicate that the device and machine/equipment being controlled shall not be operated until the tag is removed.
Threshold Limit Value (TLV)	Occupational exposure limit set by the American Conference of Governmental Industrial Hygienists (ACGIH) under which it is believed that nearly all Workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects.
Tight-fitting Respirator	A respirator that is designed to form a complete seal with the face or neck.
Time Weighted Average (TWA) Exposure Limit	The average exposure a contaminant for an individual over a given working period determined by sampling at given times during the period. Unless otherwise mentioned, TWA is the concentration of contaminants measured over an 8-hour period.
Trench	An elongated excavated area of ground whose depth exceeds its width at the bottom.
Trench Box	A self-contained steel structure placed in an excavation that is designed to withstand soil pressures and protect the Workers against cave-ins.
Unclassified/Non-classified Area	An area where flammable or toxic atmosphere is unlikely to develop or exist.
Vacuum Excavation	The use of pressurized water or air to loosen soil, then the use of a vacuum to extract the loosened

	soil. This includes all activities performed by a vacuum truck including but not limited to "hydrovac," "shot gunning," "day lighting," "potholing," "water washing."
Vapor	Gaseous form of substances that are normally in liquid or solid state; it can be changed to solid or liquid by increasing pressure, decreasing temperature, or both. Evaporation may create vapors.
Vendor	A party with whom Enbridge may enter into an agreement for the provision of engineered and/or fabricated equipment.
Verification	Confirmation that the machine/equipment is in a zero-energy state.
Verification Locate	An additional measure completed by a Contractor, after the Initial Locate, that is designed to verify that all Below Grade Facilities are surface located and marked. Typically, the Verification Locate will implement sweep or scan techniques to ensure there are no discrepancies with the Initial Locate.
Visitor	Any Enbridge or non-Enbridge individual that is not performing any assigned work activity on an Enbridge worksite (i.e. facility, right-of-way, or construction site). An example of a visitor is any individual or group on a tour of a Enbridge worksite.
Waste Management Plan	A written document designed to assist Enbridge personnel and contractors with the identification of appropriate waste management practices for each waste type generated by Enbridge operations.
What-If's	An Enbridge accepted Process Hazard Analysis (PHA) methodology.
Wipe Test	The procedure to be performed on the shielding of a radiation source, a guard or protective cover of the radioactive source, capable of detecting the presence of 0.005 microcurie of radioactive material.
Work Authorization Issuer	An Enbridge Operations Representative who shall be familiar with the operational and/or site specific hazards covered by the Work Authorization being issued.
Work Planning Templates	Templates which assist in separating out higher risk work activities ensuring that hazards and controls associated with this work are identified and engineering and administrative controls are

	developed and implemented before the start of work.
Work Restraint	Protection devices used at elevations that will not permit a Worker to travel beyond a certain point.
Workers	See Workforce.
Workforce	Terms used to refer to Employees and Enbridge Contractors cumulatively. For the sake of this manual, the term Workforce also includes Contractor Personnel.
Working Excavation	An excavation that will be entered by Workers.
Workplace	See Worksite.
Worksite	Entire work area required for the work, including station property, right-of-way, temporary working space, and all right-of-way storage areas as required by Enbridge.
Zero Energy (state)	Pertaining to the control of hazardous energy (LOTO) Zero Energy is when all energy and potential or stored energy is removed, or controlled and verified.

Appendix

Section 1.1 Variance Request Form

Variance Request Form

This form is required to be completed and approved by a Vice President or designate for any variance to a Standard, practice or requirement as set out in the Enbridge LP/MP Safety Manual. Variances are only applicable to a specific project or Standard and do not create policy. All variances shall be reviewed during annual reviews of the Health and Safety Management System. A variance shall always be in compliance with Applicable Legislation.

A. Current wording that applies to this variance request
B. Justification for the requested variance
C. Proposed wording for the requested variance

Please attach a risk mitigation plan outlining controls that will be put in place to ensure a level of protection that meets or exceeds the Standard that this variance affects.

Requestor Section

Variance Requestor	Company
Print Name:	Date:
Health and Safety Representative	
Print Name:	Date:
Construction Manager	
Print Name:	Date:

Approvals Section

Vice President Approving	
Print Name:	Date:
Director or Project Manager	
Print Name:	Date:
Regional Operations Director (if required)	
Print Name:	Date
Health and Safety Representative	
Print Name:	Date:

This form shall be kept at the regional, project or department office until the variance expires and then kept according to the document retention policy. Expiry Date:

Appendix to section 2.4

ENBRIDGE MP/LP PROJECT Contractor HEALTH AND SAFETY REQUIREMENTS

TABLE OF CONTENTS

1.0 INTRODUCTION 3
2.0 ROLES AND RESPONSIBILITIES 3
3.0 CONTRACTOR SAFETY REPRESENTATION 4
4.0 COMPETENCY ASSESSMENT AND TRAINING 5
5.0 SUBCONTRACTOR MANAGEMENT 5
6.0 CONTRACTOR EVALUATIONS, AUDITS & INSPECTIONS 5
7.0 WORKSITE CAMP FACILITIES 6
8.0 SAFETY STAND-DOWN/ENGAGEMENT MEETINGS 6
9.0 POST INCIDENT INVESTIGATION REVIEW MEETING(S) 6
10.0 HAND PROTECTION 6
11.0 MEDICAL PROVISIONS 7
12.0 SIGNAL PERSON/SPOTTERS 7
13.0 OVERHEAD UTILITIES 7
14.0 HAZARD ASSESSMENT, ELIMINATION, AND CONTROL 7

1.0 INTRODUCTION

This document defines the additional project-specific requirements for Contractor performing work for the Enbridge on Enbridge Worksites. These requirements are in addition to those outlined in the contract General Terms and Conditions and above the minimum requirements prescribed in the Enbridge LP/MP Safety Manual.

In the event of any conflict or inconsistency between the Standards or terms set out in this Appendix and the Standards or terms set out in the body of the Enbridge LP/MP Safety Manual, the Standards or terms set out in this Appendix shall prevail over the conflicting or inconsistent provisions set out in the Enbridge LP/MP Safety Manual. Any variance to a Standard set out in this Appendix shall require an approved Variance Request form in accordance with the variance procedure set out in section 1.1 of the Enbridge LP/MP Safety Manual.

2.0 ROLES AND RESPONSIBILITIES

2.1 Enbridge

Enbridge will establish responsibilities to monitor the Contractor's compliance with all applicable regulatory requirements, the Contractor's H&S Program as well as the Enbridge H&S Program where applicable. The Enbridge Representatives will:

- Review the Contractor's Safety Program, Safety metrics and Safety personnel qualifications
- Review the Contractor's training matrix
- Review and accept Contractor Specific Safety Plans, programs/procedures as applicable to the Contractor's work activities
- Conduct formal and impromptu worksite inspections to ensure Contractors AND Subcontractors are in compliance with all health and safety requirements
- Inform the Contractor of all special conditions associated with the construction and ensure the Contractor has in place the applicable procedures and specific hazard assessments prior to work commencing
- Initiate the necessary steps to correct acts, behaviors and conditions which could cause injury or property damage
- Verify the Contractor completes detailed incident investigations that identify both the immediate and basic root causes
- Follow up with the Contractor to ensure the Contractor implements interim controls and any other preventative measures or corrective actions as identified in the incident investigation report to the satisfaction of Enbridge

2.2 Contractor

The Contractor will establish responsibilities to monitor the Contractor's compliance with all applicable regulatory requirements; the Contractor's own H&S Program as well as the Enbridge LP/MP Safety Manual where applicable. The Contractor Representative will:

- Review the Enbridge's LP/MP Safety Manual
- Develop a Contractor Project Safety Plan or equivalent and submit to Enbridge for review and acceptance prior to the commencement of any work. The plan shall contain information regarding, but not limited to the following:
    - Contractor Personnel roles and responsibilities
    - Safety personnel requirements
    - Safety meetings (frequency and participation at a minimum)
    - Site inspections (frequency and accountability)
    - Safety metric reporting
    - Safety documentation templates
    - Extended Work Hours and Fatigue Management Plan
    - Hot and Cold Weather Work Plans
    - Severe Weather Plan
    - Emergency Response Plan
    - Traffic Accommodation Plan
    - Fire Prevention Plan
    - Project Specific Safety Orientation and Training documents
    - Fall Protection Plan
    - Project-specific safety goals and evaluation criteria
    - Description of planned safety incentive plan

The Contractor is required to accurately identify all relevant work types within ISN and provide verification through ISN of the applicable work type review and acceptance. The Contractor H&S Program shall contain applicable information regarding, but not limited to the following as required:

- Safety Observation Program
- Safety Violation and Incident Reporting Procedure
- Medical Management of Personal Injury Program
- Investigation Procedure
- Preventative Maintenance Program
- Respiratory Protection Program
- Control or Hazardous Energy Program (Lock Out/Tag Out or LOTO)
- Confined Space Entry Program
- Overhead Utility Program

The Contractor is required to maintain approved status within ISNetworld at all times while performing work activities for Enbridge. Any changes in status are to be reported to Enbridge immediately.

Contractor and Sub-Contractor Management shall be engaged in the promotion of safety at worksites. It is expected that Management is actively involved by regularly visiting the site, conducting documented safety inspections, participating in safety meetings, and attending Safety Stand-down events. Measurement activities shall be developed and included in the Contractor documents for performance review between the Contractor Enbridge at intervals outlined in the Enbridge LP/MP Safety Program.

3.0 CONTRACTOR SAFETY REPRESENTATION

The degree of Contractor safety representation required for each project will be determined in advance of construction prior to award and identified in the bid documents.
Each project is analyzed to determine the appropriate level of safety representation which is required to provide adequate field presence. The following factors shall be considered when making this decision:

- Scope, complexity, and length of the Work
- The geographical location of the Work
- Total number of Contractor and Subcontractor workers on site
- The number of crews and how they are spread out
- The risks/hazards associated with the Work.
- The type and nature of work activities being performed

There are two levels of representation required by Enbridge:
Level 1:
United States
A combined Supervisor or Worker/Safety Representative is required to have the OSHA 510-30 hour (current within the last five years) or approved equivalent training on projects with 15 or less people on site.

Canada
A combined Supervisor or Worker/Safety Representative is required to have, at a minimum, Leadership for Safety Excellence or approved equivalent training on projects with 15 or less people on site within 5 years of the start date of their scope of work.
Level 2:
A minimum of one full time Safety Representative with NO OTHER field construction duties is required for any project with 16 or more people on site (or equivalent).

In addition, Enbridge may approve other comparable qualifications after a review of the person's combination of training and experience. Other approved qualifications may be but are not limited to:

- Completion of Occupational Health and Safety certificate from a recognized Post-Secondary Education Source; or Certified Safety Professional (CSP), Canadian Registered Safety Professional (CRSP).

The Contractor's Safety Representative's resume of qualifications and experience shall be submitted prior to work for approval by the respective Enbridge Safety Coordinator.

Additional Contractor Safety Representatives will be required when the workforce exceeds 51 personnel and at every interval of 50 after that. Additional safety personnel may be required as specified in the bid documents. For Mainline construction work one senior safety person, two field safety representatives and one safety administrator for a sizeable pipeline spread.

Enbridge reserves the right, at its sole discretion, to change the number of required Contractor Safety Representatives assigned to the Work, accept or reject the suitability of any Contractor Safety Representative, and where making a change or rejecting a Contractor Safety Representative, Enbridge will provide the Contractor with written justification of that decision.

The Contractor Safety Representative shall coordinate the requirements of the Contractor's H&S Program and the Enbridge LP/MP Safety Manual, and advise the Contractor on matters related to occupational health and safety.

4.0 COMPETENCY ASSESSMENT AND TRAINING

The Contractor shall ensure sufficient and qualified resources are allocated to satisfy both the Contractor and Enbridge H&S Programs as described herein. Contractor shall, at the request of Enbridge, provide validation of its qualifications and records of training for all Contractor personnel performing Work. Contractor shall keep current training records readily available for review by Enbridge at its request.

The Contractor shall, at its own expense, ensure that all Contractor personnel have completed the necessary Health, Safety and job-related training required as per applicable legislation for the Work prior to commencing any Work. Any additional safety training that may be required by Enbridge shall be paid for by Enbridge.

The Contractor shall ensure that all Contractor and Subcontractor personnel have completed any required Site- or Work-specific Safety Orientations prior to commencing any work at the Work Site.

Where required by Enbridge, Contractor management, supervisors and foremen shall participate in, obtain, or demonstrate compliance with any required Enbridge approved H&S leadership training.

5.0 SUBCONTRACTOR MANAGEMENT

Where a Contractor employs Subcontractors to perform a portion of the Work, the Contractor is required to have a Subcontractor H&S Management process which will be submitted for review and approval by Enbridge via ISNetworld.

The Contractor is required to assess whether a Subcontractor is capable of satisfying the Contractor's H&S Program requirements as set out herein prior to awarding any Work to that Subcontractor. Where the Subcontractor is incapable of satisfying those requirements, Contractor shall not award the Subcontractor any Work.

Enbridge may participate in the Contractor's H&S assessment of the Subcontractor if Enbridge deems appropriate at Enbridge's sole discretion.

The Contractor shall make available for review by Enbridge upon its request any documentation that the Contractor has reviewed and evaluated to assess Subcontractor's H&S Management System.

Enbridge reserves the right at its sole discretion to reject the Contractor's selection of any Subcontractor. An explanation of the Enbridge's justification will be provided in writing to the Contractor at the Contractor's request.

6.0 CONTRACTOR EVALUATIONS, AUDITS & INSPECTIONS

The Contractor may be subject to evaluations by Enbridge. The results of the evaluations may be shared with the Contractor by Enbridge at the Contractor's request. An evaluation may take, but is not limited to, the following forms:

- Formal audit by an internal or external auditor
- Informal inspections during or after the execution of the Work; and/or

- Post Work evaluations.

The above evaluations may occur annually, during the execution of the Work, or upon completion of the Work at the Enbridge's sole discretion.

Enbridge will provide notification to the Contractor in writing in accordance with the audit provisions contained within the Part 4 of the Contract where it intends to carry out a formal audit.

The Contractor shall, at its own expense, cooperate and make themselves available for audits by Enbridge or third party chosen by Enbridge as requested.

Completed audits and/or evaluations may be uploaded to the Enbridge's ISNetworld account for access by the Contractor and other Enbridge entities.

7.0 WORKSITE CAMP FACILITIES

Contractor must, where applicable, provide a camp facility that meets all applicable legislation and regulations pertaining to work camps and the Contractor shall be aware of and compliant with such applicable laws and regulations.

Camp inspections will be completed and documented by a competent camp manager or camp representative and Enbridge representative to ensure accommodations are acceptable and to ensure the camp is compliant with all regulatory requirements. This should be completed immediately after set up and before camp occupancy.

8.0 SAFETY STAND-DOWN/ENGAGEMENT MEETINGS

Enbridge reserves the right to conduct Safety Stand-down or Engagement meetings as required to address Contractor-initiated safety stand-down for all personnel will be required for the scope of the Work and/or project duration. The purpose of the stand-down may include but not limited to review of project safety performance, opportunity for management to reinforce their commitment to safety, recognize employees as a group, recognize individuals who have demonstrated exemplary safe behavior, discuss opportunities for improvement and upcoming challenges, provide training, invite motivational safety speakers to present, etc. The minutes of the Safety Stand-down will be forwarded to Enbridge Safety Personnel.

9.0 POST INCIDENT INVESTIGATION REVIEW MEETING(S)

In the event of an incident, and based on the severity and potential severity of the incident, the following personnel from the Contractor and Enbridge (minimum) shall jointly have a post incident investigation review meeting to discuss the incident, assign corrective actions when necessary and determine the communication of pertinent information stemming from the incident(s).

Contractor:

- Project Manager
- Superintendent
- Foremen
- Safety Personnel

Enbridge:

- Construction Mgr. or designate
- Project Manager
- Chief Inspector
- Safety Personnel

Enbridge reserves the right to increase participating personnel e.g. Contractor corporate management, Enbridge management, etc., dependent on the severity of the incident in order to effectively review the incident and provide the appropriate actions thereafter. The minutes of the meeting shall be forwarded to Enbridge Safety Personnel.

10.0 HAND PROTECTION

Where there is a danger of injury to worker's hands, arms, legs or the trunk of the body, the Contractor shall ensure workers wear proper hand, arm, leg, or body protection equipment that is appropriate to the work being done and the nature of the hazard involved (e.g., wearing long sleeves during brushing activities, chaps for chainsaw operation, etc.).

The Contractor shall ensure that all workers that handle rough, sharp-edged abrasive materials or are performing work activities that subject workers' hands to lacerations, punctures, burns, vibration/impact, chemical absorption, are wearing appropriate hand protection suitable for the work being performed.

The only exceptions are when the use of gloves creates an additional hazard or the work task is administrative in nature and/or the other standard PPE is not required (office areas, etc.)

11.0 MEDICAL PROVISIONS

The Contractor shall provide approved temporary medical services where the size/scope of the project and/or the geographical location determines the need. This requirement shall be determined by the Enbridge on a project specific basis.

Services shall be positioned on the project and available for use for all project personnel and utilized as part of the Contractor and Sub-Contractor medical management plan(s).

12.0 SIGNAL PERSON/SPOTTERS

The Contractor shall provide a competent signal person/spotter as defined in Enbridge's Contractor Safety Program for each excavator (e.g., trackhoe) when being utilized on the project. The spotter shall be provided by the Contractor and an "air horn" signalling device to be utilized during all equipment spotting / signalling activities. In addition, the Contractor shall develop a common procedure denoting the signals or blasts of the "air horn" that all signal person/spotters shall utilize on the project and shall be submitted to the Enbridge for review and approval.

13.0 OVERHEAD UTILITIES

The Contractor shall provide an overhead utility crossing plan, which shall include at a minimum:

- Requirement for a dedicated spotter during work/crossing activities
- Roles, Responsibilities, Training and Qualification requirements
- Drawing(s) outlining precautionary measures for work/crossing i.e. identification, design and placement of "goal posts"
- Identification of voltages
- Measurement of line heights
- Placement of cones/barrels within the travel lane
- Controlling induced voltage
- Signage and barriers
- Consideration of power poles and guy wires
- Pre/post crossing inspection sheet(s)
- Goal post crossing maintenance personnel and schedule(s)

Goal post(s) or similar shall not be taken down for any reason during work/crossing activities. The Contractor shall identify and design a goal post commensurate with the aforementioned requirement.

14.0 HAZARD ASSESSMENT, ELIMINATION, AND CONTROL

Hazard Assessments are required prior to the issuance of an Enbridge Safe Work Permit.

The Contractor shall have a written process in place to identify, assess, and rank the hazards associated with their work and take appropriate measures to eliminate or mitigate the hazards in accordance with the hierarchy of controls.

At a minimum, this program (change to process or change above process to program) shall contain the following elements:

1. Project Hazard Assessment
2. Job Hazard Assessment (JHA) or equivalent
3. Field Level Hazard Assessment (FLHA) or equivalent

The hazard assessment document and completion time shall be agreed upon by the Contractor and Enbridge and completed throughout the Contractor scope of work.

14.1 PROJECT HAZARD ASSESSMENT

The Contractor shall complete a Project Hazard Assessment for all general work activities. For brownfield sites, the Enbridge shall review and provide a copy of the Enbridge's facility hazard assessment to the Contractor. The Contractor shall incorporate the facility hazard assessment information affecting their general work activities into their Project Hazard Assessment. A copy of the completed Project Hazard Assessment shall be provided to Enbridge for review prior to site mobilization. The completion time for this assessment shall be agreed upon by the Contractor and Enbridge during pre-job planning activities.

As a minimum, the Project Hazard Assessment shall include:

- The date of completion

- The name(s) and role(s) of the contractor representative completing the assessment
- List of general work activities to be performed
- The existing or potential safety hazards associated with the general work activities
- The controls required (using the hierarchy of controls) to eliminate or reduce these hazards to as low as reasonably practicable
- Signatures of all workers performing the general work activities

Following mobilization, supervisors shall review and update the Project Hazard Assessment if the scope of work changes. The Contractor shall review the updated assessment with the crew prior to work for additional input. This review with the crew is a critical component of the Hazard Assessment process and shall be completed on an ongoing daily bases.

14.2 JOB HAZARD ASSESSMENT

Contractors should have written work procedures for all job activities being performed at the Enbridge's worksite. In the absence of written job procedures, a Job Hazard Assessment (JHA) or equivalent is required to be completed by the contractor. The Contractor shall provide copies of the applicable work procedures and/or completed JHA to Enbridge prior to being issued a safe work permit and starting work. As a minimum, JHAs or their equivalent must include:

- The date of completion
- The name(s) and role(s) of the contractor representative completing the assessment
- Title of the job being assessed
- The steps involved in performing a specific job
- The existing or potential safety hazards associated with each step
- The controls required (using the hierarchy of controls) to eliminate or reduce these hazards to as low as reasonably practicable
- Signatures of all workers performing the job

It is the contractor's obligation to ensure all workers participating in the job understand the procedure(s) and/or JHA(s) associated with the work.

14.3 FIELD LEVEL HAZARD ASSESSMENT (FLHA)

Every shift, contractor workers shall complete a FLHA or an equivalent just prior to the start of work. It shall be completed at the worksite location in efforts to identify and control the field-based hazards of the work being performed, and site or environmental conditions that may adversely affect the work (e.g., icy conditions, simultaneous operations, pedestrians). The Contractor must ensure FLHAs are reviewed and updated as work or conditions change throughout the shift. As a minimum, FLHAs or their equivalent must include:

- The date and time of completion
- The name(s) of the contractor workers completing the assessment
- List of jobs being performed
- The existing or potential safety hazards associated with the job/field conditions
- The controls required (using the hierarchy of controls) to eliminate or reduce these hazards to as low as reasonably practicable
- Signatures of all workers performing the job

A FLHA may cover individual or group work provided the group of individuals are performing the same task. Workers performing the work must participate in the FLHA completion. Any additional worker joining the work activity must review, attempt to identify additional hazards and controls and sign off on the active FLHA.

Field Level Hazard Assessment (FLHA)

ENBRIDGE

SWP #: (if applicable)		**Location:**	**Scope of Work:**
Date:	**Time:**		
Emergency #:			
Completed by:			

HAZARDS

Physical
- ❑ Atmosphere (O_2, LEL, H_2S, Benzene)
- ❑ Ignition sources
- ❑ Struck by/against
- ❑ Caught in between
- ❑ Compressed gas
- ❑ Stored energy/pressure
- ❑ Line of fire
- ❑ Slips/trips/falls
- ❑ Ground conditions
- ❑ Working at heights
- ❑ Simultaneous Operations
- ❑ Overhead work
- ❑ Buried utilities
- ❑ Access/egress
- ❑ Traffic
- ❑ Congested area
- ❑ Mobile equipment
- ❑ Drowning
- ❑ Energized Electrical (overhead, buried, exposed)
- ❑ Sharp edges
- ❑ Excavation/cave-in
- ❑ Static electricity
- ❑ Induced voltage
- ❑ Welding flash
- ❑ Violence
- ❑ Radiation
- ❑ Adapter cords #

Ergonomic ____
- ❑ Heavy/awkward loads
- ❑ Overexertion
- ❑ Unstable position
- ❑ Overhead work
- ❑ Vibration
- ❑ Overreaching
- ❑ Manual lifting
- ❑ Repetitive motions

Chemical
- ❑ Explosive/flammable
- ❑ Corrosive
- ❑ Oxidizing agents
- ❑ Acute/chronic toxicity
- ❑ Highly reactive
- ❑ Skin/eye irritants

Environmental
- ❑ Weather conditions
- ❑ High winds
- ❑ Air quality
- ❑ Dry surroundings (fire)
- ❑ Noise
- ❑ Inadequate lighting
- ❑ Extreme temperatures
- ❑ Remote access to ER
- ❑ Damp/wet conditions
- ❑ Icy/Muddy conditions
- ❑ Spills/leaks

Biological
- ❑ Mold
- ❑ Biological waste
- ❑ Poisonous plant
- ❑ Animals/insects

Personal Limitations
- ❑ Non-routine work
- ❑ New/Inexperienced
- ❑ Working alone
- ❑ Fatigue

Other Hazards:

CONTROLS
- ❑ System de-pressurized
- ❑ Purge/ventilate lines
- ❑ Gas detection
- ❑ Ventilation
- ❑ Energy isolation/LOTO
- ❑ Fire watch
- ❑ Fire extinguisher
- ❑ Spark containment
- ❑ Intrinsically safe equipment
- ❑ GFCIs
- ❑ Warning signs
- ❑ Fall protection plan
- ❑ Specific work procedure
- ❑ Scaffolding
- ❑ Ladders/stairs
- ❑ Mechanical lifting
- ❑ Tag lines
- ❑ Rescue equipment
- ❑ Grounding/bonding
- ❑ Utility locates
- ❑ Trench box/shoring
- ❑ Proper excavation/slopes
- ❑ Ground leveling/planking
- ❑ Rig matting
- ❑ First aid kit
- ❑ Eye wash station
- ❑ Additional lighting
- ❑ Ground water control
- ❑ Spill kit
- ❑ Windsock
- ❑ Housekeeping
- ❑ Barriers/flagging
- ❑ Inspection (area, tools)
- ❑ Correct body placement
- ❑ Spotters/safety watch
- ❑ Signage
- ❑ Emergency notification
- ❑ Man down pendants
- ❑ Procedure/practice review
- ❑ Required training complete and current
- ❑ On the job training
- ❑ Work/rest cycles
- ❑ Restricted work hours
- ❑ Direct supervision
- ❑ Restricted work duties
- ❑ Pre-job meeting
- ❑ Communication plan
- ❑ Extraction/rescue plan
- ❑ Electrical safe approach
- ❑ MSDS reviewed & onsite
- ❑ Proper disposal of waste
- ❑ Control insects/wildlife/ plants

PPE
- ❑ Hard hat
- ❑ Safety glasses w/ side shields
- ❑ Goggles
- ❑ Face shield
- ❑ Hearing protection
- ❑ Protective footwear
- ❑ Arc flash PPE
- ❑ FR clothing
- ❑ Gloves
- ❑ High visibility vest
- ❑ Personal Flotation Devices
- ❑ Chemical clothes, boots
- ❑ Resp. protection
  - o ½ mask
  - o full face
  - o Cartridge _____
  - o Supplied air
  - o SCBA

Other Controls:

Field Level Hazard Assessment (FLHA)

ENBRIDGE

TASKS	HAZARDS	CONTROLS

Worker's Involved: All persons performing this work must print name and initial below and comply with Enbridge safety policies and government regulations. Work must stop immediately should conditions change/new hazards appear or an emergency occur on the site.

Retain with Safe Work Permit (if applicable); otherwise retain for 3 months

VERSION 2 (Revised March 1, 2014)

Section 6.2 SWP

Safe Work Permit

ENBRIDGE

Part A: Work Details

Work Type: ☐ Hot ☐ Cold

Work Environment: ☐ Hazardous ☐ Restricted ☐ Unclassified

Emergency Contact: _____ (Name) (Ph #)

Alternate: _____ (Name) (Ph #)

Fire/Police/Ambulance : _____

Emergency Assembly Area: _____

Date/Time Issued	MM/DD/YY	Time
Date/Time Expired	MM/DD/YY	Time
Permit Extended (new expiry)	MM/DD/YY	Time
Extension Authorized by:	Permit Issuer or Designate	
Suspended at:	MM/DD/YY Time	Permit Receiver Initials
Revalidated at:	MM/DD/YY Time	Permit Issuer Initials
Work Authorization Form # (if applicable)		

Location: *Physical address, geographical description*

Work Scope/Description

Frequency of Contact with Permit Issuer or Designate: ☐ Not applicable ☐ Daily ☐ Weekly ☐ Other:_____

Date								
Initial								
Date								
Initial								

Part B: Preplanning Documentation

	Yes	No	N/A
Contractor hazard assessment (e.g. JHA) required?			
Applicable procedures have been reviewed?			
Electrical Isolation Clearance Form required?			
Equipment Isolation Procedure Form required?			
Confined Space Permit required? *Permit #*			
Critical Lift Plan required?			
Serious Lift Plan required?			
Fall Protection Plan required?			
Excavation Checklist required?			
Ground Disturbance Permit required?			
Open System Routine Maintenance Job Planning Template required?			
Pipeline Repair/Modification Job Planning Template required?			

Additional preplanning requirements from Permit Issuer:
Use this space to indicate simultaneous operations that may affect the working group, etc. (e.g. tank fill occurring, pig launching/receiving) or other special comments/instructions

Part C: Special Precautions and Considerations

	Yes	No	N/A
Is it necessary to notify other departments?			
Are barriers, flagging, or warning signs required?			
Is bonding or grounding required?			
All workers have current required orientation?			
Has containment been provided for any liquid release?			
Is spark containment/control required?			
Facility Emergency Shutdown Devices considered?			
Have precautions been taken for X-ray/radiation work?			
Special PPE requirements? If yes, specify below			
All workers have applicable safety training?			
Site specific hazards identified and discussed?			
Is a fire watch required?			

Other special precautions or considerations:

Part D: Area Atmospheric Testing

Is gas testing/monitoring required? ☐ No ☐ Yes (☐ Continuous ☐ Periodic _____)

	Initial Result	2nd Result	3rd Result	4th Result	5th Result	6th Result	7th Result	8th Result
LEL – Flammable Vapors: LEL (0-10%)								
Oxygen: O_2 19.5-23%[CAN] 23.5% [US]								
Hydrogen Sulphide:H_2S(<10ppm)								
Carbon Monoxide: CO(<25ppm)								
Benzene (<0.5ppm)								
Other								
Time of Test								
Tester's Name (Initial must be completed by Enbridge Rep)								

Part E: Permit Approval

Work cannot begin until the required approvals are on this document and a field level hazard assessment has been completed by the work group. All persons performing this work must comply with Enbridge safety policies and government regulations. Work must stop immediately should conditions change/new hazards appear or an emergency occur on the site.

Permit Issuer

Name: _____

Signature: _____ Ph #: _____

Transfer of Responsibility

Name: _____ Date/Time: _____

Signature: _____ Ph #: _____

Permit Receiver

Name: _____ Company : _____

Signature: _____ Ph #: _____

Transfer of Responsibility

Name: _____ Date/Time: _____

Signature: _____ Ph #: _____

Part F: Permit Returned

Returned by	Received by	Date/Time Returned	MM/DD/YY	Time

☐ FLHA(s) returned for the work

Comments: *(e.g. work complete, ongoing, incomplete; area cleaned up)*

Distribution: White – Permit Receiver, Gold – Permit Issuer Retain white copy for 2 years VERSION 8 (Revised March 1, 2014)

CAN000000

Work Authorization Form

ENBRIDGE

Part A: Work Details

Emergency Contact: _____
(Name) (Ph #)

Alternate: _____
(Name) (Ph #)

Fire/Police/Ambulance : _____

Emergency Assembly Area: _____

Location: *Physical address, geographical description*

Work Scope/Description

Date/Time Issued	*MM/DD/YY*	*Time*
Date/Time Expired	*MM/DD/YY*	*Time*
Authorization Extended (new expiry)	*MM/DD/YY*	*Time*
Extension Authorized by:	*Issuer or Designate*	
Suspended at:	*MM/DD/YY* *Time*	*Receiver Initials*
Revalidated at:	*MM/DD/YY* *Time*	*Issuer Initials*

Frequency of Contact with Permit Issuer or Designate:
❑ Not applicable ❑ Daily ❑ Weekly ❑ Other:_____

Date								
Initial								
Date								
Initial								

Part B: Term and Conditions of Work Authorization

Operational and/or site specific hazards reviewed and discussed (e.g. Facility Hazard Assessment)? ❑ No ❑ Yes ❑ N/A

Terms and conditions: *Use this space to indicate how operational and/or site specific hazards were reviewed and discussed, work restrictions, simultaneous operations that may affect the working group (e.g. tank fill occurring, pig launching/receiving), additional Company Inspectors, etc. or other special comments/instructions*

Part C: Work Authorization

Work cannot begin until Safe Work Permit(s) has been issued and a field level hazard assessment has been completed by the work group. All persons performing this work must comply with Enbridge safety policies and government regulations. Work must stop immediately should conditions change/new hazards appear or an emergency occur on the site.

Issuer:

Name: _____

Signature: _____

Phone Number: _____

Company Inspector: ❑ LPE ❑ MP ❑ Ops

Name: _____

Signature: _____

Phone Number: _____

Part D: Work Authorization Returned

Returned by	Received by	Date/Time Returned	*MM/DD/YY*	*Time*

Comments:

Distribution: White – Inspector(s), Gold – Issuer

Retain white copy for 2 years

VERSION 1 (Revised March 1, 2014)

Section 8.5 Confined Space Entry Permit

CONFINED SPACE ENTRY PERMIT (Hazard Assessment)

Part 1: Description

Date of Permit: _____ Contractor: _____ Location: _____
Time Permit Issued: _____ Time Permit Expires: _____ Time Work Completed: _____
Emergency Response Contact Info (e.g. phone #, radio channel): _____
Confined Space to be Entered: _____

Type of Work:
- ❑ Cold
- ❑ Hot (Permit #:_____)
- ❑ Electrical – line side of 480V main breaker (clearance/isolation form required)

Work Environment:
- ❑ Hazardous
- ❑ Restricted
- ❑ Unclassified

Confined Space Class: (non-permit confined spaces require only parts 1, 4, and 6 of this permit)
- ❑ Class 1 ❑ Class 2 ❑ Class 3
- ❑ Non-Permit Confined Space (include rationale): _____

Scope of Work: _____

Job Tasks:

❑ Welding	❑ Tank cleaning	❑ Wind farm activities	❑ Loading/unloading scrapers	❑ _____
❑ N_2 purge	❑ Electrical work	❑ Vac truck operations	❑ Motor or pump maintenance	❑ _____
❑ Hydrotest	❑ Tank roof access	❑ Area/equipment inspection	❑ Valve inspection/maintenance	❑ _____
❑ Line repair	❑ Prover/meter work	❑ Heavy equipment operation	❑ _____	❑ _____

Key Steps (Related Job Tasks):
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Part 2: Hazard Assessment (Hazard Identification)

Physical
- ❑ compressed gas/air
- ❑ ignition sources
- ❑ hot work
- ❑ fires/burns
- ❑ pinch points
- ❑ slips/trips/falls
- ❑ line of fire/body position
- ❑ walking/work surfaces
- ❑ working at heights
- ❑ others working/simultaneous operations
- ❑ grinding
- ❑ hand/power tools
- ❑ falling objects
- ❑ suspended loads
- ❑ hoisting/overhead work
- ❑ buried utilities
- ❑ entry/exit into the space
- ❑ congested area
- ❑ mobile equipment/vehicles
- ❑ sharp edges/material
- ❑ excavation/cave-in
- ❑ slopes and terrain
- ❑ engulfment
- ❑ drowning
- ❑ entrapment
- ❑ security

Energy
- ❑ electrical less than 480V
- ❑ electrical greater than or equal to 480V
- ❑ stored energy
- ❑ pneumatic
- ❑ hydraulic
- ❑ mechanical
- ❑ pressure
- ❑ radiation
- ❑ fluids and gases
- ❑ energized equipment
- ❑ static/induced voltage
- ❑ rotating equipment
- ❑ moving equipment

Atmospheric and Chemical
- ❑ asphyxiation
- ❑ O_2 deficiency
- ❑ O_2 enrichment
- ❑ explosive/flammable materials
- ❑ corrosive material (acids/caustics)
- ❑ hydrogen sulfide
- ❑ benzene/toluene etc.
- ❑ coker naphtha
- ❑ asbestos
- ❑ carbon monoxide
- ❑ welding fumes
- ❑ abrasive blast dust
- ❑ cleaners/degreasers
- ❑ gasoline or diesel
- ❑ pipeline coating
- ❑ NGL
- ❑ herbicides/pesticides
- ❑ natural gas
- ❑ mercaptan
- ❑ highly reactive substances
- ❑ skin irritants

Environmental
- ❑ cold environment
- ❑ hot environment
- ❑ noise
- ❑ traffic in area
- ❑ weather conditions
- ❑ dusty environment
- ❑ dry surroundings
- ❑ poor lighting (bright/dark)
- ❑ damp/wet conditions
- ❑ poor housekeeping
- ❑ spills
- ❑ waste/debris

Ergonomic
- ❑ vibration
- ❑ fatigue
- ❑ overexertion
- ❑ awkward position
- ❑ manual lifting
- ❑ repetitive motion
- ❑ unstable position
- ❑ heavy/awkward loads
- ❑ over reaching

Biological
- ❑ Mold
- ❑ biological waste
- ❑ poisonous plant material
- ❑ exposure to animals/insects

Other Hazards not listed: _____

Part 3: Hazard Assessment (Hazard Controls)

Engineering/Equipment
- ❑ scaffolding
- ❑ ladders/stairs
- ❑ mechanical lifting device
- ❑ energy/equipment isolation (LO/TO)
- ❑ system depressurized
- ❑ adequate explosion proof lighting
- ❑ additional lighting
- ❑ explosion proof extension cords
- ❑ explosion proof electrical
- ❑ spark arrestors
- ❑ fire extinguisher (type/size) _____
- ❑ purge space/lines with inert gas
- ❑ mechanical ventilation (capacity) _____
- ❑ mechanical ventilation alarms (alarm that indicates failure of the ventilation equipment e.g. CO, RPM)
- ❑ tag line for loads
- ❑ barriers/barricades/guards
- ❑ 2-way radios
- ❑ traffic control devices/signs
- ❑ control ignition sources
- ❑ wind sock
- ❑ bonding/grounding equipment
- ❑ air shut offs
- ❑ first aid kit
- ❑ approved eye wash station
- ❑ welding screen
- ❑ spill kit/absorbent material

Administrative
- ❑ specific work/entry procedure (attach to permit)
- ❑ fall protection plan
- ❑ housekeeping
- ❑ inspection (area/tools)
- ❑ correct body placement
- ❑ spotter
- ❑ work/rest cycles
- ❑ signage
- ❑ ergonomic assessment

Personal Protective Equipment
- ❑ head protection
- ❑ safety glasses
- ❑ safety goggles
- ❑ faceshield
- ❑ hearing protection
- ❑ protective footwear
- ❑ FR clothing
- ❑ leather clothing/gauntlets
- ❑ gloves (type) _____
- ❑ chemical resistant clothing
- ❑ respiratory protection
  - O supplied air
  - O SCBA
  - O air-purifying (cartridge) _____
- ❑ fall protection
- ❑ personal multi-gas monitor- Calibration/Bump Test Date: ____

Electrical
- ❑ electrical safe limits of approach understood and maintained
- ❑ high voltage probe/gloves
- ❑ GFI protection
- ❑ arc flash PPE (as per NFPA 70E)
- ❑ voltmeter not used on conductors greater than 750v (CAN) or 600v (USA)
- ❑ competent & qualified electrical workers
- ❑ test & confirm voltage on electrical conductors

Biological
- ❑ Proper disposal of waste
- ❑ Control insects/wildlife
- ❑ Environmental impact controlled

Other Controls not listed: _____

Part 4: Air Testing Requirements

Tester's Name: _____

Testing Equipment/ Methods: _____

Calibration/Bump Date: _____

Initial Testing	Results
O_2	
H_2S	
LEL	
CO	
Benzene	
Other _____	
Tester's Initials:	

Part 5: Onsite Evacuation and Rescue
- ❑ Written rescue/evacuation plan developed
- ❑ Roles and responsibilities established and reviewed with responsible parties
- ❑ Communication plan established
- ❑ Rescue equipment on-site as required
- ❑ Rescue equipment identified, available and inspected
- ❑ Nearest Medical Facility: (Specify) _____
- ❑ Offsite/Contractor rescue team (review rescue plan at Pre-job meeting)

Part 6: Approvals

Work cannot begin until the required signatures are on this document. All persons performing this work must comply with Enbridge safety policies and government regulations. Work must stop should conditions change/new hazards appear or an emergency occurs on the site.

Permit Approver	Permit Issuer	Permit Receiver
Print Name: _____	Print Name: _____	Print Name: _____
Signature: _____	Signature: _____	Signature: _____

By signing this permit, the receiver acknowledges that all safety requirements have been met, have been reviewed with the workers, will be maintained for the duration of the permit and it is safe to proceed with the work. All workers participating in the work must sign in the area provided on the back of the permit during the pre-job entry meeting.

Part 7: Pre-job Meeting

Confined Space Entry Supervisor (print/sign): _____
This signature authorizes the entry of the following workers into the confined space.

Workers Involved (print/sign)

1. _____	8. _____	15. _____
2. _____	9. _____	16. _____
3. _____	10. _____	17. _____
4. _____	11. _____	18. _____
5. _____	12. _____	19. _____
6. _____	13. _____	20. _____
7. _____	14. _____	21. _____

Topics to be reviewed:

- ❑ Confined Space Classification
- ❑ Hazards and Controls
- ❑ Communication Plan
- ❑ Confined Space Attendant responsibilities
- ❑ Procedures/plans to be followed – entry, safe work, evacuation/rescue (attach to permit)
- ❑ Air Testing (Initial air testing results and frequency of further testing)
- ❑ Conditions under which entry is not allowed or must be terminated
- ❑ Entrant responsibilities/tracking requirements (sign in/out with confined space attendant)

Conditions Under Which Entry is to be Terminated:

Pre-job Entry Meeting Notes:

Frequency of Ongoing Air Testing (results must be recorded at the interval):

Personal Monitor Required? ❑ Yes ❑ No

❑ Continuous for O_2, LEL, H_2S, CO (mandatory): Testing results to be recorded every _____.

❑ Other toxins to be tested: _____ Frequency of testing: _____
_____ Frequency of testing: _____
_____ Frequency of testing: _____

Reminder: If the confined space has been unoccupied for any length of time, tests shall be performed and recorded before a worker enters or re-enters the space.

Part 8: Ongoing Air Testing Results

Time of Test								
Tester's Name								
Tester's Initials								
O_2								
H_2S								
LEL								
CO								
Benzene								
Other (Specify)_____								
Other (Specify)_____								

Part 9: Entrant Tracking (Completed by the Confined Space Attendant)

If needed, additional tracking sheets may be created and used. Attach them to the permit.

Confined Space Attendant Name: Confined Space Attendant Signature:

Entrant Name	Entry Time	Exit Time	Entry Time	Exit Time	Entry Time	Exit Time
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						

Confined Space Attendant Notes:

- ❑ Communication system with entrants: _____
- ❑ Communication system with CSE supervisor: _____
- ❑ Communication system with rescue team: _____

Section 15.4 Ground Disturbance Permit

ENBRIDGE — Ground Disturbance Permit — Permit# 00000

PROJECT INFORMATION		
Date:	Time Issued:	Time Expired:
Project Name:	Project #:	Contractor:
Facility Owner(s):	Site Location:	Station/Spread/Km:
	Excavation Depth:	Excavation Width:
Work Description and Extent of Excavation:		Surface Locate Distances 100 ft. (30m) Positive Identification Distances 16 ft. (5m) Mechanical Clearance 2 ft. (0.6m)
Hazards/Special Conditions:		

- "Written Agreements" makes reference to – Crossing, Construction, Road Use, Road Crossing, Proximity, Parallel and Right-of-Way Agreements
- All permits are void during an emergency situation- Permits must be re-issued or re-validated after an emergency, change to the job description or scope, or if the Company site Representative or the Contractor competent person is replaced by someone else.

PLANNING & DOCUMENTATION	YES	NO	N/A
Has the project received confirmation for the use of the land from the Land Services Dept.?	☐	☐	☐
Are available records referenced (e.g., line locate diagrams, drawings, alignment sheets, blueprints, as-builts, site photos) and have contacts been made to determine the existence and location of underground pipelines and cables near the excavation area?	☐	☐	☐
Have Written Agreements, As-Built, Plan Drawings, and Alignment Sheets been reviewed by all parties involved, and are available onsite when required by regulation?	☐	☐	☐
Have all facility owners been given proper notification as required by Regulations and the Written Agreements?	☐	☐	☐
Has One-Call Service been notified and confirmation received? (Ticket#)_____ (Expires)_____	☐	☐	☐
Have non-members of the One-Call Services been notified with a request to locate and stake their facilities?	☐	☐	☐
Have facility owners responded to the "locate request" and located their staked facilities including but not limited to the Enbridge Initial Locate?	☐	☐	☐
Has the Verification Sweep been completed and logged for all identified and unknown buried facilities?	☐	☐	☐
Checking "NO" to any of the above requires regional or project management sign off to continue.	☐	☐	☐

PERFORMING LOCATES AND VISUAL INSPECTION	YES	NO	N/A
Has the Ground Disturbance Package (GDP) been reviewed by required personnel?	☐	☐	☐
Have all locate and/or drawing discrepancies been resolved with the locator and facility owner/operator?	☐	☐	☐
Does the locating/staking correspond with the Written Agreements and site observations?	☐	☐	☐
Have all buried facilities been visibly exposed in accordance with Company Standard, Written Agreements and Regulations?	☐	☐	☐
Are there any signs of construction activity in the area, to indicate other possible buried facilities (cathodic and telephone pedestals, cut lines, etc.)	☐	☐	☐
Have all below facilities on the drawing(s) been surface located and marked/staked within the proposed excavation and within the required distance of the outer perimeter of the exposed excavation as per the Company Standard?	☐	☐	☐
Are above ground facilities (e.g., power lines, cable trays, pipe racks) identified, signs erected and hazard controls established to prevent contact and to maintain a safe clearance?	☐	☐	☐

PRE-EXCAVATION	YES	NO	N/A
Has the Excavation Perimeter (see defined terms) been clearly established for the operator and spotter?	☐	☐	☐
Has a pre-excavation meeting been held including a "walk Around/Site Inspection" to review scope of work with all parties involved?	☐	☐	☐
Are all parties involved aware of the safe work procedures and requirements associated with the planned Ground Disturbance work?	☐	☐	☐
Has the Safe Work Permit been reviewed with all workers involved? (Safe Work Permit Reference #)_____	☐	☐	☐
Has a designated Ground Disturbance Supervisor been appointed? (Name)_____	☐	☐	☐
Has the Ground Disturbance training/ certification been verified for members of the work crew and the Ground Disturbance Supervisor?	☐	☐	☐
Have the equipment operators been designated as competent (OQ for US only)?	☐	☐	☐
If required, are the below grade facility owner representative(s) on site for the Ground Disturbance Work?	☐	☐	☐
Have the conditions of all the written agreements been met?	☐	☐	☐
For excavations requiring buckets with teeth, has written approval been obtained and available?	☐	☐	☐
Reason for using buckets with teeth: Frozen ground ☐ Rock ☐			
Have hazards around pipe, cable support, testing for induced current and air testing for toxic or combustible gases been addressed?	☐	☐	☐
Have excavation access/egress and evacuation procedures specific to this Ground Disturbance been reviewed by all parties involved?	☐	☐	☐
Have crews reviewed the safe clearance requirements for above and below grade facilities?	☐	☐	☐
Will the Adjacent Pipeline or Pipelines have to be depressurized/operated at a reduced pressure?	☐	☐	☐
Are existing excavations, adjacent areas and protection systems for above grade facilities inspected by a competent person daily before starting work?	☐	☐	☐
Are all known or suspected appurtenances, changes in elevation or alignment daylighted?	☐	☐	☐
As a minimum, are all existing pipelines, cathodic, cables or conduits that enter or cross the proposed excavation have the top and sides daylighted at points 1m (3ft) beyond each side of the excavation and at the midpoint of the excavation?	☐	☐	☐
Is material available for safety fences and barricades to be erected where required?	☐	☐	☐

EXCAVATION	YES	NO	N/A
Are existing below grade facilities protected from inadvertent contact and supported when excavation is in progress?	☐	☐	☐
Have the requirements of the excavation checklist been met if workers are entering during excavation?	☐	☐	☐
Are spoils, materials and equipment set back at least 1m (3 ft.) from the edge of excavation?	☐	☐	☐
Are workers and facilities protected from loose rock, soil, or other objects that could pose a hazard by falling or rolling into the excavation or from the bucket?	☐	☐	☐

RESTORE/BACKFILL	YES	NO	N/A
Have facility owners been notified prior to the proposed backfill work, in accordance with the Written Agreements?	☐	☐	☐
Have the facility owner representatives inspected their facilities prior to the proposed backfill work? (Name)_____	☐	☐	☐
Have the required backfill clearances be established and maintained? Mechanical Clearance for backfilling is 600 mm (2 ft.)			
Has a backfill inspection report been completed?	☐	☐	☐
Owner "contact" declined / exempted to be on site. (Name)_____ (Phone)_____	☐	☐	☐
Have all hydrovac holes no longer required for reference been backfilled accordingly?	☐	☐	☐
Have warning signs been installed?	☐	☐	☐
Have records been updated?	☐	☐	☐
Has the worksite been cleaned up and restored?	☐	☐	☐

GROUND DISTURBANCE PERMIT AUTHORIZATION		
By signing this permit, all parties acknowledge that the safety requirements have been met, and are understood by everyone involved in the Ground Disturbance		
Permit Issuer (inspector or designate)	(Print)	(Sign)
Permit Receiver (Contractor, Supervisor / Foreman)	(Print)	(Sign)
Equipment Operator	(Print)	(Sign)
Facility Owner(s)- (If Applicable)	(Print)	(Sign)
Facility Owner(s)- (If Applicable)	(Print)	(Sign)

GROUND DISTURBANCE PERMIT SIGN OFF		
By signing off this permit, all parties acknowledge that work has been completed or suspended and all personnel have been informed.		
Permit Issuer (inspector or designate)	(Print)	(Sign)
Permit Receiver (Contractor, Supervisor / Foreman)	(Print)	(Sign)
Equipment Operator	(Print)	(Sign)

Distribution: White – Permit Receiver, Gold – Permit Issuer Retain white copy VERSION 1 (Released January 5th, 2015)

ENBRIDGE WORKING EXCAVATION CHECKLIST

Date	Time

EMPLOYER:

SITE ADDRESS:

ONE-CALL/FIRST CALL NOTIFIED/LOCATES & MARKING COMPLETE: _____ YES _____ NO

WORKING EXCAVATIONS 1.2 m (4 ft.) DEEP AND DEEPER REQUIRE THE FOLLOWING (Check if present on site)
Note: Working Excavations less than 1.2 m (4 ft.) require an Excavation Checklist completed by a qualified/competent person and a soil analysis to ensure it safe to work in

	Qualified/Competent Person		Soil analysis (visual and manual)
	Egress		Confined space (O_2 testing)
	Inspection		Sloping required (If no testing is done, the width of the excavation will be the bottom width plus three times the depth. This will equal a 1½:1 ratio.)

SOILS REFERENCE (Check if present on site)

Type C (1½:1)		Type B (1:1)		Type A (1:1)	
	Fissures		Previously disturbed Type A or B		Undisturbed
	Porous soil		Fissured Type A		Type of soil (circle one): Rocky Clay Silty clay Sandy clay Clay loam
	Vibration		Subject to vibration Type A		
	Water (Rain, etc.)		Type A rock not stable		
	Submerged soil		Type of soil (circle one): Silt Silty loam Sandy loam Crushed rock		
	Previously disturbed soil				Compressive strength ≥ 1.5 tsf
	Type of soil (circle one): Gravel Sand Loamy sand			Test Method(s) Used by Investigator	
			Compressive strength > 0.5 tsf, but Compressive strength < 1.5 tsf		Pocket Pentrometer
					Slope Torvane
	Compressive strength ≤ 0.5 tsf				Manual Method:

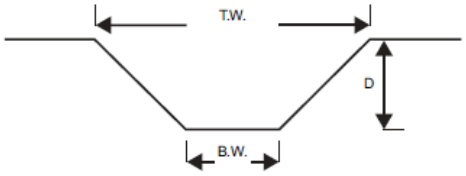
. tsf = tons per square foot

ADDITIONAL FACTORS (Check if present on site)

	Utilities identified, located, and supported
	Egress from excavation
	Warning vests
	Exposure to falling loads
	Water accumulation
	Stability of adjacent structures (undercutting)
	Spoil pile 1 m (3 ft.) feet back
	Qualified/Competent person inspections
	Fall protection
	Use of protective system
	Use of guardrails, fences, barricades, or covers

PROTECTIVE SYSTEMS						
SLOPING AND BENCHING SYSTEMS						
	Option (1) -- Slope the excavation at an angle not steeper than one and one-half horizontal to one vertical (34° measured from the horizontal).					
	Option (2) -- Have a competent worker classify the soil using manual and visual tests, and slope a maximum of: • Type A: 1:1 (45°) • Type B: 1:1 (45°) • Type C: 1½:1 (34°)					
	Option (3) -- Install shoring or use a trench box.					
		Parameters		Limits		On site
	Registered Professional Engineer/Name:				License #	
	Option (4) -- Design by a registered professional engineer -- Mandatory in excavations 20 feet or more in depth					
		Magnitude of slopes		Safe Configurations		On site
	Registered Professional Engineer/Name:				License #	
SUPPORT SYSTEMS, SHIELD SYSTEMS, & OTHER PROTECTIVE SYSTEMS						
	Option (1) -- Design using shoring components meeting minimum regulatory requirements					
	Option (2) -- Designs using manufacturer's tabulated data and specifications					
	Option (3) -- Designs using other tabulated data					
		Parameters		Limits		On site
	Registered Professional Engineer/Name:				License #	
	Option (4) -- Design by a registered professional engineer					
	Plan indicating sizes, types, & configurations					
	Registered Professional Engineer/Name:				License #	

Specify dimensions of excavation on drawing below. Use the space provide for calculations or to add any additional information



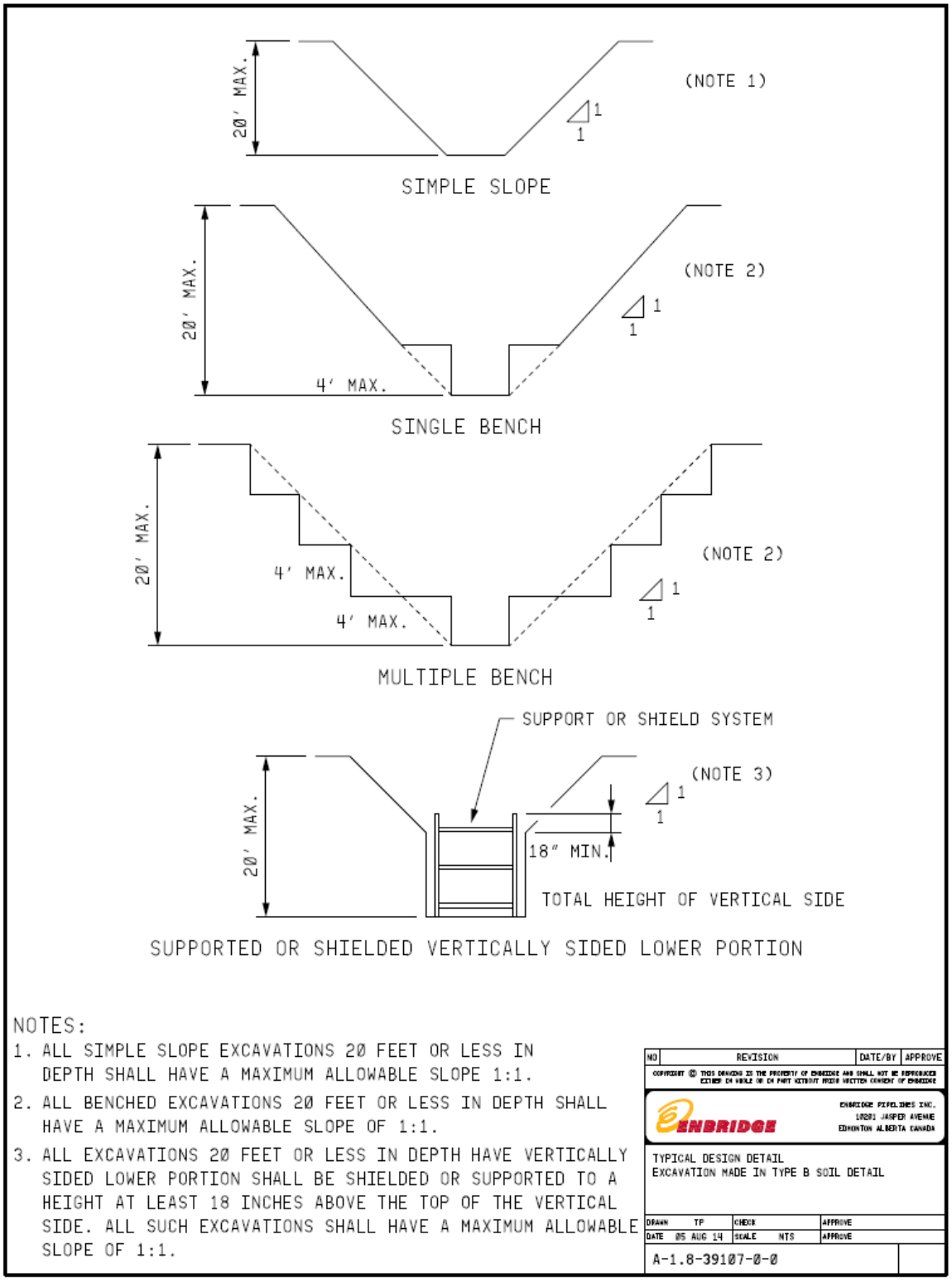
T.W. - Top Width D - Depth B.W. - Bottom Width

Description/Comments:

Qualified/Competent Person Determination - Suggested Questions:

a) Who designated you to be the Q/CP?
b) Do you have the authority to correct hazards?
c) Do you have the authority to stop the work?
d) What type of training have you had to be the Q/CP?
e) Do you know what type of soil you are working with?
f) How did you identify what type of soil you are working with?
g) What type of test (visual and manual) did you use to classify the soil?
h) How do you know what type of protection system to use for each soil type?

	Print Name	Sign	Date
QUALIFIED/COMPETENT PERSON:	_____	_____	_____
OPERATOR:	_____	_____	_____
ENBRIDGE REPRESENTATIVE:	_____	_____	_____



NOTES:

1. ALL SIMPLE SLOPE EXCAVATIONS 20 FEET OR LESS IN DEPTH SHALL HAVE A MAXIMUM ALLOWABLE SLOPE 1:1.
2. ALL BENCHED EXCAVATIONS 20 FEET OR LESS IN DEPTH SHALL HAVE A MAXIMUM ALLOWABLE SLOPE OF 1:1.
3. ALL EXCAVATIONS 20 FEET OR LESS IN DEPTH HAVE VERTICALLY SIDED LOWER PORTION SHALL BE SHIELDED OR SUPPORTED TO A HEIGHT AT LEAST 18 INCHES ABOVE THE TOP OF THE VERTICAL SIDE. ALL SUCH EXCAVATIONS SHALL HAVE A MAXIMUM ALLOWABLE SLOPE OF 1:1.

NO	REVISION	DATE/BY	APPROVE

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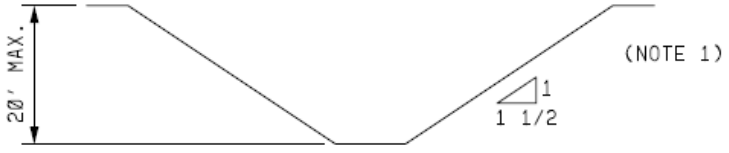
ENBRIDGE

ENBRIDGE PIPELINES INC.
10201 JASPER AVENUE
EDMONTON ALBERTA CANADA

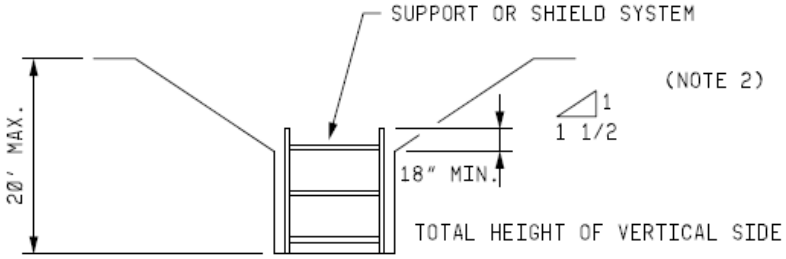
TYPICAL DESIGN DETAIL
EXCAVATION MADE IN TYPE B SOIL DETAIL

DRAWN	TF	CHECK		APPROVE	
DATE	05 AUG 14	SCALE	NTS	APPROVE	

A-1.8-39107-0-0



SIMPLE SLOPE



SUPPORT OR SHIELDED VERTICALLY SIDED LOWER PORTION

NOTES:
1. ALL SIMPLE SLOPE EXCAVATIONS 20 FEET OR LESS IN DEPTH SHALL HAVE A MAXIMUM ALLOWABLE SLOPE 1 1/2:1.
2. ALL EXCAVATIONS 20 FEET OR LESS IN DEPTH HAVE VERTICALLY SIDED LOWER PORTIONS SHALL BE SHIELDED OR SUPPORTED TO A HEIGHT AT LEAST 18 INCHES ABOVE THE TOP OF THE VERTICAL SIDE. ALL SUCH EXCAVATIONS SHALL HAVE A MAXIMUM ALLOWABLE SLOPE OF 1 1/2:1.

NO	REVISION	DATE/BY	APPROVE

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ENBRIDGE

ENBRIDGE PIPELINES INC.
10201 JASPER AVENUE
EDMONTON ALBERTA CANADA

TYPICAL DESIGN DETAIL
EXCAVATION MADE IN TYPE C SOIL DETAIL

DRAWN	TP	CHECK	APPROVE
DATE	05 AUG 14	SCALE NTS	APPROVE

A-1.8-39199-0-0